THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVIII. No. 1483.] LONDON, OCTOBER 13, 1891. [43RD YEAR. Price 6d.

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The matter composing this book consists mainly of articles written for, and published in, the JOURNAL. The preface says: "In view of new processes that seem to fall in thick and fast one on the other, it has been several times suggested that they should be collected together, so as to form a record of the various gas-making processes that have been proposed in the past, together with some account of the natural laws that govern the manufacture and supply of Illuminating Gas."

The work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification

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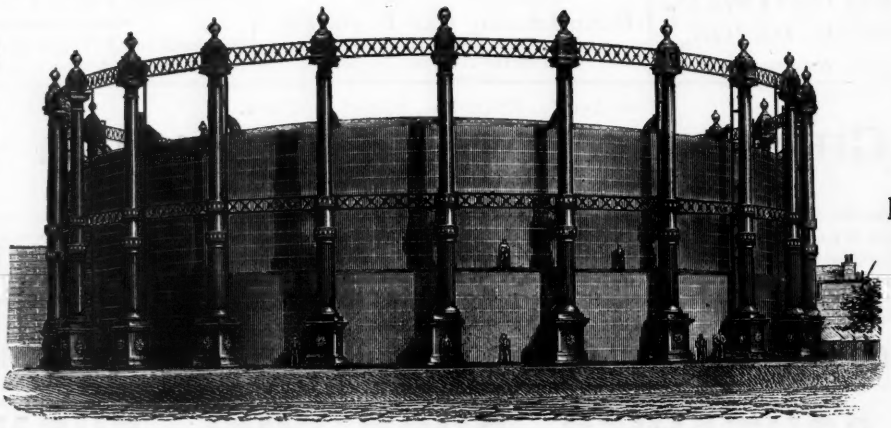

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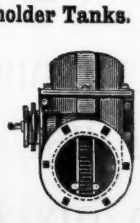

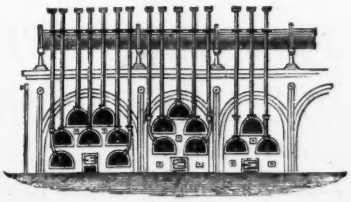

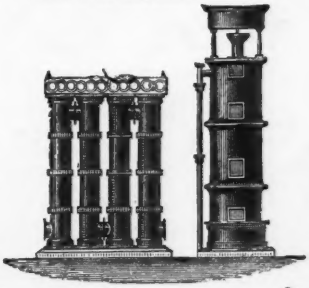

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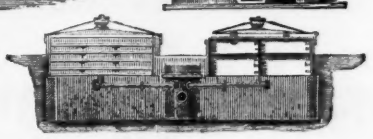

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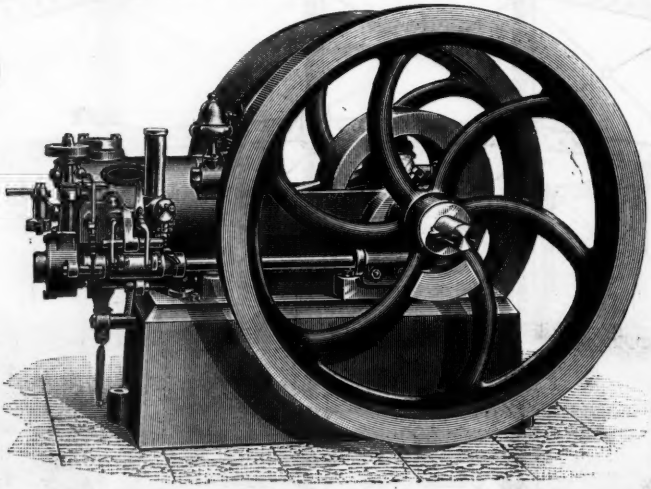

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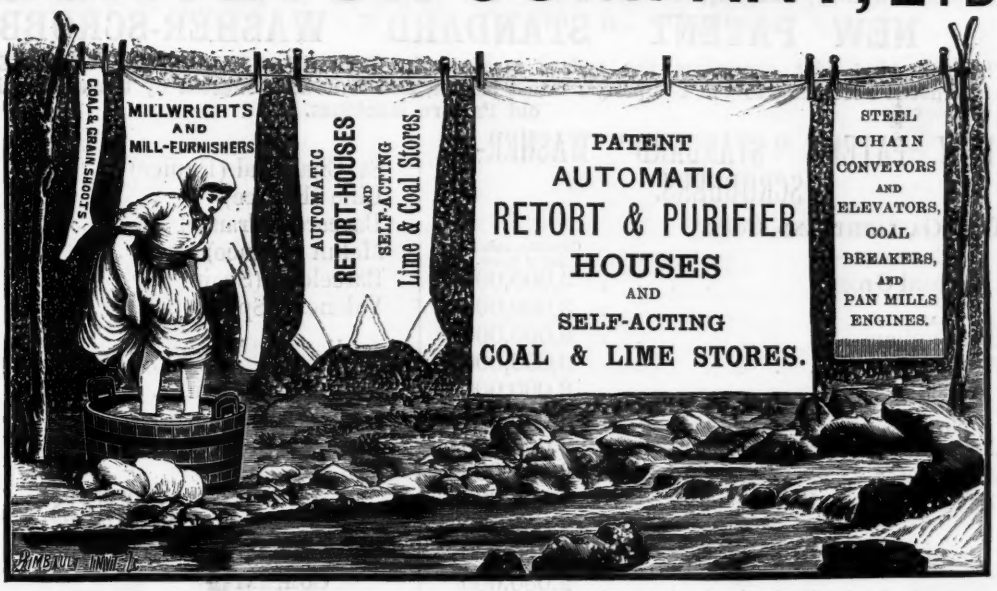
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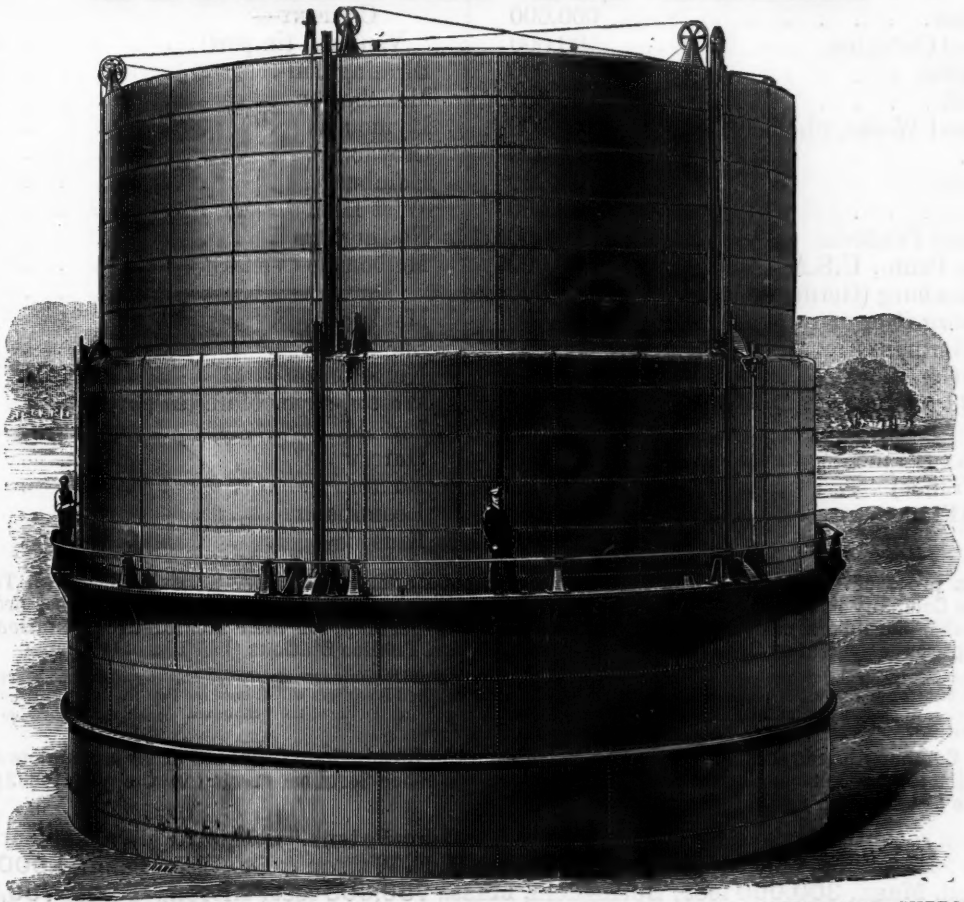

TWO-LIFT GASHOLDER, WITH TANK, WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.
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Luton	1,000,000
Valparaiso	600,000
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Halle (Germany)	600,000
Erfurt (Germany)	400,000
Elberfeld (Germany)	600,000
,, ,,	600,000
Bordeaux (France)	2,000,000
Nice (France)	875,000
Nancy (France)	525,000
,, ,,	525,000
St. Chamond (France)	350,000
Lille (France)	250,000
Baccarat (France)	175,000
Melun (France)	210,000
Barcelona (Spain)	875,000
Valencia (Spain)	875,000
,, ,,	200,000
,, ,,	200,000
Santander (Spain)	350,000
Vercelli (Italy)	200,000
Alger (Algiers)	875,000

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Manchester	2,500,000
Plymouth	2,000,000
Croydon	1,500,000
Edinburgh	1,500,000
West Ham	1,500,000
Nottingham	1,500,000
Melbourne (Victoria)	1,500,000
,, ,,	1,500,000
Maidstone	1,000,000
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Enfield	300,000
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Kidsgrove	100,000

As a proof of the value of the invention, it may be added that, after an extended trial, The Gaslight and Coke Company have given a second order for the apparatus for their Beckton Works, a third order for two new Washer-Scrubbers, each for 3,000,000 cubic feet of Gas per day, for their Kensal Green Station, and have also adopted the system at their Nine Elms, Shoreditch, and Pimlico Stations (*Vide* List of Orders).

The patent wooden devices are being continually fitted to existing "Standard" Washers where renewals are required, and are made in segmental bundles to fit between the wheel plates, similar to the present iron sheets; and Engineers will at once see that the substitution of the improved wooden devices in place of the indented iron sheets will so very materially prolong the life of the "Standard" Washer-Scrubbers as to warrant the outlay for renewal.

The Company have recently received an order from the Birmingham Corporation for a complete set of these devices for the 5,000,000 cubic feet per day "Standard" Washer-Scrubber erected in the year 1882; also for a duplicate of this Machine (*Vide* List of Orders).

Orders recently advised by United States Agent for Patent "Standard" Washer-Scrubbers as follows: Brookline, Mass., 750,000 cubic feet; H. F. Watson & Co., Erie, Penn., 1,000,000 feet; Taunton, Mass., 300,000 feet; Springfield, Mass., 750,000 feet; Altoona, Penn., 750,000 feet.

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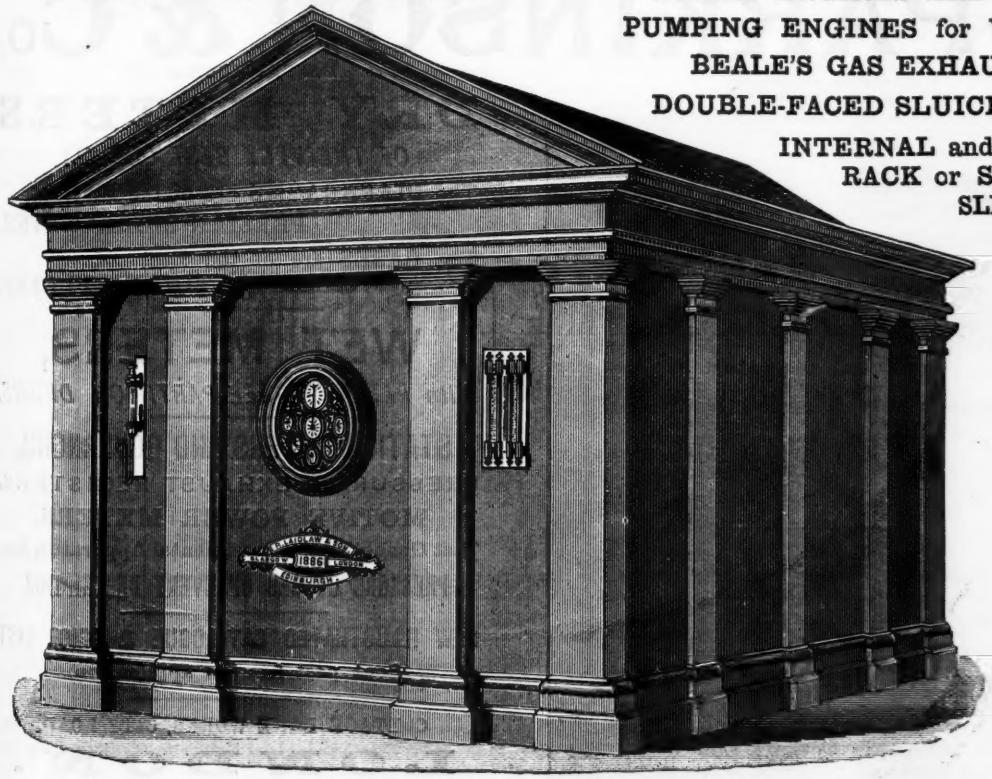

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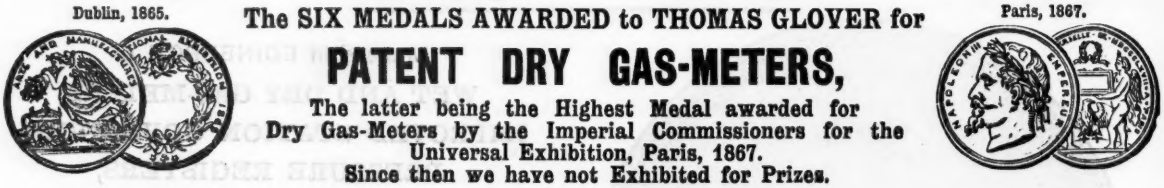

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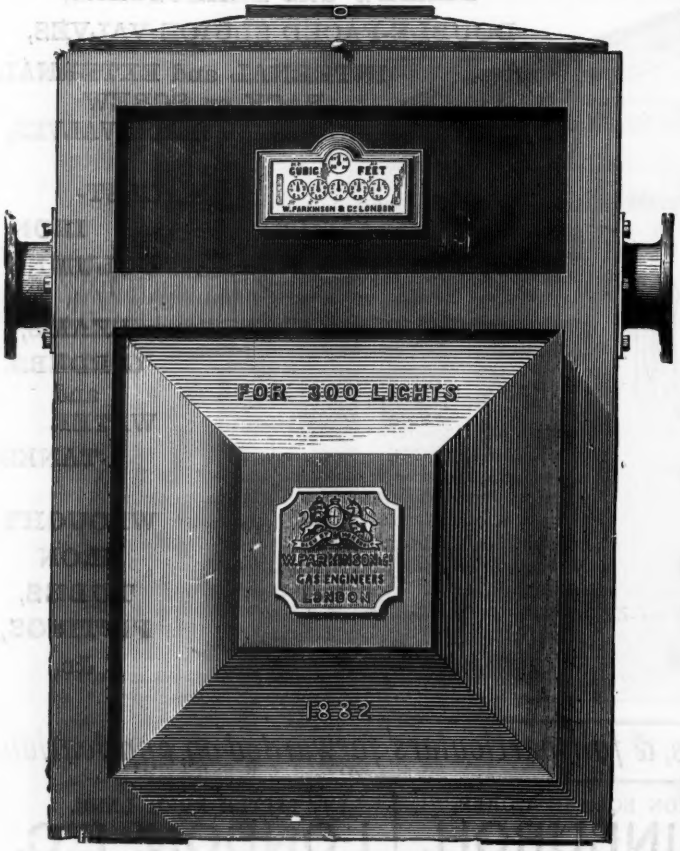

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 13, 1891.

The Commercial Meeting—Coal and Labour Topics.

THE meeting of the Commercial Gas Company last Friday could hardly have been more dreary and dispiriting if the whole of the Company's property had been lost, and the appointment of a Receiver had loomed in the near future. We discussed, in the last issue of the JOURNAL, the accounts relating to the past half-year's working; and therefore it is unnecessary to go into the figures afresh. But the salient fact that the undivided profits have to be dipped into somewhat heavily, in order to provide for the usual dividend, seems to have plunged the worthy Chairman (Mr. J. Blacket Gill) into a state of mind only to be fittingly described by the familiar saying that he was "in the dumps." We have on a former occasion complimented Mr. Gill upon his possession of the knack of addressing an assembly of gas shareholders in an interesting fashion; but, really, unless he plucks up a little more courage for the next meeting, we shall be reluctantly compelled to qualify our appreciation of the Commercial Chairman by confessing that he lacks heart for playing against odds. Let us hope, however, that Mr. Gill will take warning by the reception that his dejected remarks have received on the present occasion, and set himself to dispel the impression that he has in him only the makings of a fair-weather gas administrator, which would be a fatal reputation. For it must be understood that, although a gas undertaking is ordinarily a safe business, as businesses go, and the heads of such concerns may be favoured for years with conditions that require of them no more than a suave demeanour and a reputation for strict integrity, yet gas supply, like every human enterprise, has its seasons of storm and stress which show of what mettle its administrators are made. In the early years of gas supply, Directors had to do many other things besides meet once a week, ratify a few contracts, and lunch together in a friendly way. Then, after the Metropolitan gas business had got into a fairly comfortable groove, the "pestilent" Croll arose to shake the board-rooms out of their accustomed calm; and long after this disturbance was quelled, the coal famine, with its portentous product, the sliding scale, cropped up for the tribulation of Directors of the ordinary brand. Worse troubles than these may be in store, in which case, happy will those Gas Companies be who have strong men at their head. But for the present there is little enough the matter; and for a Chairman of a Gas Company like the Commercial to recommend the payment of a 13¾ per cent. dividend "with tears in his voice," as Mr. Gill did last Friday, is a spectacle more calculated to excite risibility than to attract sympathy from the beholders. What if the Commercial Company have not earned their dividend, and have little hope of earning it for the current half year, is this either a singular or a peculiarly terrifying circumstance? They have a good reserve to draw upon first; and a reserve would be of no advantage if it could not be used occasionally to tide over a tight time. And beyond this there is always the possibility of raising the price of gas. The Commercial Company, unlike their larger neighbours, have not yet seen the necessity of taking the latter step. Why, then, is Mr. Gill so melancholy? The fact is that the Company have been rather hard hit by the recent rise in coal; and they have not been able to do well enough with their coke to render the price of coal a matter of comparative indifference. Moreover, they are very badly off in regard to their labour, which costs more, and is not so good as it used to be.

Well, with respect to coal prices, we have always held firmly to the one opinion—that the very heavy advances of the past eighteen months could not be maintained. Those purchasers of gas coals who agreed with us and fought against the coal-owners have found their profit in so doing. Those who lost their heads and renewed contracts on the top of the market have been pinched pretty severely, as they deserved to be; but the worst of it is that, in many cases, the consumers have had to pay most of the penalty. We have the satisfaction of knowing, however, that the past year or so has done more to knock the bottom out of the pernicious long contract system than anything else that could have happened. Now the word is being passed round that coke is not going off well—a sure sign of impending slackness of trade. More, it is reported that steamers are joining the ranks of the unemployed in every harbour of the United Kingdom—another sign of similar import. What does this mean? It can only mean one thing—that the inflated prices of coal cannot be long continued; and that gas coal purchasers, if they know their business, will soon be able to breathe more freely in presence of their natural enemies, the coal-owners. We are loth to use such a term in this connection; but truth will out. If any man is yet in doubt respecting the character of the recent movement in coal prices, he cannot do better than inquire of Mr. C. E. Jones, of Chesterfield, who enjoys the privilege, such as it is, of knowing coal owners and dealers "at home." We have all along regarded the enhancement of the price of coal as artificial, and therefore temporary, because coal residuals did not rise proportionately in value. Now, if coal is scarce, everything that comes from coal must be scarce also; which has not been so this time. Gas coke, however, was in demand

some time before coal rose, and thereby helped to demonstrate that there was in the country a need of fuel which would not be balked by any reasonable increase that might take place in its price. When coal once began to go up, it went beyond all reasonable limit; and the natural result has followed. Coke is accumulating as it has not done for the last three years; and gas manufacturers who are yet feeling the pinch of high coal prices are growing very dismal over the prospect. It is hard to bring comfort to such as have bought coal forward at dear rates; but we are persuaded of one thing—that the right course to follow in the circumstances is to clear the coke away for what it will fetch. Hoarding up coke will never bring down the price of coal; but flooding the country with it will certainly do so. House coal will first feel the influence; and gas coal must follow. This is how we read the signs of the times.

With regard to the labour troubles of the Commercial Company, we have little to say that would be regarded by Mr. Gill as consolatory; but it is necessary to place prominently before the world the result of this Company's experience of shortened shifts and Union control. It is, simply, that the work not only costs more, but is not so well done as formerly. The Commercial experience is not singular in this regard; but the result, as we have expressed it, is of the gravest moment for employers and employed throughout the country. For what is the claim of Labour for shorter hours of work, if not that the condition of the labourer is so much improved thereby that he is worth more even to his employer, and more to the nation as a citizen, than when he works long hours for his daily bread? It is the boast of the British workman that he can produce more in his nine hours, or ten hours, as the case may be, than the Frenchman or the German is able to turn out by working twelve or fourteen hours at the same trade. But if the gas stoker is deteriorated by working the eight-hour shift, of what advantage is it to anybody? It is certainly none to the employer, for whom it represents an increase of at least one-third in the labour bill. When the employer declares, however, that he would not object to this if the work were as well done as before, but that what he complains of is that the work is not so satisfactory, how is he to be answered? Yet this is precisely what Mr. Gill says for the Commercial Company, following after Colonel Makins, M.P., who said the same for The Gaslight and Coke Company. These two gentlemen are at the head of Gas Companies who employ between them more eight-hour men and more Union men than all the other concerns in the kingdom together; and they agree in bearing public testimony to the failure of both systems, as reflected in the quality of the work done. It is by far the most damaging indictment of Eight-Hourism and Unionism that has seen the light; and, unless it is to prevail in public opinion, it must be answered. This accusation is far more worthy of the attention of Thorne and the other Union leaders than any amount of mass meetings, banner presentations, or the other amusements by which the wire-pullers of Unionism endeavour to keep their followers in heart. For they may be sure of one thing—that a system of working which is an economical failure will inevitably be abandoned sooner or later when the opportunity serves. After they had failed to check by brute force the revolt of the South Metropolitan Gas Company and others against Union domination, there was only one hope for Thorne and Co.—to prove that Union men are better than the so-called "blacklegs," whose inexperience and lack of fibre constituted the staple of so many open-air orations on Peckham Rye and elsewhere. But if the men who hold the Union cards are demonstrably worse than their rivals—worse carbonizers, worse timekeepers, and worse men in every respect of which an employer takes notice—how can they expect to retain their position? One can understand an employer saying: "I don't like the Union; but I have nothing to say "against the way the Union men do their work." Such an employer would not be justified, in the estimation of the rest of the community, in turning out his Union men without valid reason. But if he can say truthfully: "I have no "prejudice for or against any Union; but since my men "have worked shorter shifts and become unionists, they "have seriously deteriorated," he would have public opinion at his back in clearing out the men who had acted so as to disgrace the name of Unionism. With regard to the Commercial Company, it appears that the Directors of this undertaking, like the Management of the Chartered, are piling up a damning charge against the Gas Workers' Union. Whether or not they mean to act upon it, we cannot say. Possibly they may be biding their time. But if they ever do take action, these remarks from the chair about the disappointing results of shorter shifts and Union control will have their effect.

Retort-Stoking Machinery.

In another column will be found a report of the paper on machinery for working gas-retorts read before the Society of Engineers on Monday last week by Mr. Henry O'Connor, together with the discussion upon it, in which many gas managers of standing and experience took part. It is easy to understand the reason why a goodly sprinkling of papers bearing upon the practical engineering side of gas manufacture should find their way to this Society, where they receive advantages of publication which the more distinguished Institution of Civil Engineers does not confer. All engineers, whether members or associates of the Institution or not, look to it as the centre of light and leading in engineering; but, with all respect be it said, the Institution is a little old-fashioned in its treatment of authors and papers. There is not sufficient publicity for the latter; and the former are therefore deprived of some of the advantage which they would gain by the immediate circulation of their communications. We do not go so far as to say that Mr. O'Connor's is a typical Institution paper which the Society of Engineers managed to secure by reason of the greater freedom of their principles in regard to publication. It is a good paper, so far as it goes, and is especially useful for the manner in which the author has traced the development of retort-working machinery; but it does not make any addition to the existing stock of knowledge of the subject. Indeed, it is difficult for anybody to say something very fresh upon so well-worn a topic as the working of gas-retorts with the assistance of machinery. Yet the question is of such abiding interest that gas engineers cannot leave it alone for long. Everybody is of the same mind with regard to the desirability of using machinery as freely as possible, in substitution for hand labour, in the heavy work of coal carbonizing; and there is similar agreement as to the feasibility of doing so, upon general principles. Yet nobody is quite satisfied with the actual condition of retort-stoking machinery. Perhaps we shall not shock many prejudices by remarking that, whereas West's hand-power machines, so well known everywhere, and spoken of so highly for many years, were the most satisfactory aids to the stoker ever introduced into a retort-house, equal success has not been so generally ascribed to the further steps that have been taken in the direction of abolishing the stoker altogether, and replacing him by a machinist. In many places, and more especially in large establishments, the power machines of the various designs mentioned by Mr. O'Connor answer very well indeed; and the work of gas making in several of the largest manufacturing stations in town and country could not now be done without them. We fancy, however, that a good deal less objection would be heard against this kind of machinery if it were more adaptable to small, or even to medium-sized factories. This is where the inclined retort system recommends itself so strikingly; for a single setting will do as well as a hundred. We trust that gas managers will go on trying and discussing stoking machinery; for if there is any unfounded prejudice against any particular system of mechanical or gravitation stoking, it can be more easily talked out of existence than suppressed in any other way.

Federation Fails.

The climax of the present struggle of the forces of New Unionism in Wapping against the pressure of economic laws, began last Monday, when a determined attempt was made to bring about a block of the traffic to and from the wharves where the struggle originated. The Union leaders have made a great parade of the imaginary powers of the various Federations which they claim to have organized among the different Unions whose members are more or less interested in wharf and river-side work; but they have not been able to stop the revolted wharfingers' business. Representatives of the Unions have met frequently at convenient public-houses, and have passed resolutions pledging their supporters to measures of most tremendous severity against the Carron and Hermitage people; but, beyond the publication of the resolutions in the *Trades Unionist*,

nothing has come of these valiant counsels. Employers generally have met these declarations with the simple warning that any refusal to touch goods from the wharves in question will be met with instant dismissal; and this notification has been more effectual than all Mann and Tillett's windy proclamations. As a matter of fact, the Unionists have relied mainly, as they always do, upon violence and intimidation for carrying their point. While the nominal leaders prate of Federation and a general boycott, the men take to brickbats, just as they did at Leeds and Bristol. If the brickbats win, then Unionism triumphs; if they are firmly met, and quelled by good generalship and sufficient force of police, the leaders begin to talk of "negotiations"—which simply means a preparation for retreat. The *St. James's Gazette*, in the course of a good descriptive account of last week's doings, points the obvious moral of the story; saying that "it has "been proved more clearly than ever that the one "weapon of the New Unionism is intimidation, and that "the counter-weapon is a strong body of police." Late in the week, it was reported that the strike would in all probability spread, because several wharves contemplated reducing the standard rate of wages to 5d. per hour. The mere rumour threw the Unionists into a fever of excitement; as well it might, because it opened their eyes to the fact that, by spending their strength in a conflict which did not involve a substantial reduction of wages, they have left themselves powerless against an attack upon this far more vital position. Yet what can they do? They extorted higher wages, by main force, from employers who made no secret of their intention of reverting to the old scale of pay at the earliest possible moment. If, seeing the Unions exhausted, the employers seize their opportunity, is it not paying the men back in their own coin? Of course, a great outcry will be made; and if the reduction is carried out, the Unions will promptly go to pieces. The question whether dockers' work in London is to be paid for at the rate of 6d. or 5d. per hour is, however, a matter of economics; and if the police can keep the peace, it will settle itself either now or at some future time, notwithstanding all that Federation and mass meetings can do to control the issue.

The Changes in the Staff of The Gaslight and Coke Company.—The re-arrangement of duties among the chief executive officers of The Gaslight and Coke Company, which has been in progress for some time past, and respecting the nature of which various reports have been in circulation, is now, we understand, complete. Mr. G. C. Trewby, M. Inst. C. E., has been relieved of his responsibility in regard to the carbonizing work of the different stations of the Company; and now he confines his attention to works of construction. Mr. G. F. L. Foulger has received the title of Chief Distributing Engineer, with the chairmanship of the meetings of the Engineers of the several stations, whose positions are improved, and who are now directly responsible to the Directors for the gas making at their respective works. There have, we believe, been no personal changes of any importance in the head-quarters or clerical staff; and none are in contemplation.

Statistics of Gas Supply in the United States.—In answer to inquiries addressed to 102 different places by the conductors of the *American Gaslight Journal*, some interesting statistics as to the quantity of gas supplied in the first half of the present year, as compared with the corresponding period of 1890, have been obtained; and the results are summarized in a recent number of that publication. It should be mentioned that altogether only 72 replies were received; and in the case of five, the required information—answers to two questions only—was courteously refused. Of the 67 replies sent, eight were from companies whose business is upwards of 100 million cubic feet per annum; and of the remainder, the average yearly business does not exceed 15 millions. The total outsend from January to June last was 3,590,211,389 cubic feet, as compared with 3,271,785,028 cubic feet in the first half of 1890—an increase of 318,426,361 cubic feet, or 9·7 per cent. Our contemporary thinks this is a very remarkable showing, when everything in connection with the figures that make it up is considered. In nine of the places under review, the companies likewise operate electric lighting machinery; and of the remaining 58, all are more or less in direct competition with well-equipped arc and incandescent electric plants. At only three of the places was any notable reduction made in gas-rates. The second question referred to the number of meters in use; and here the showing is still more satisfactory. The figures are: Meters in use from January to June last, 213,449; do. in the corresponding period of last year, 197,050—increase, 16,399, or 8·3 per cent. The average quantity of gas passed through each meter in the first half of 1891 was 16,867 cubic feet, against an average of 16,603 feet in the corresponding period of 1890, or a gain of 264 feet per meter.

WATER AND SANITARY AFFAIRS.

THE absence of Mr. Gadesden from the chair at the half-yearly meeting of the East London Water Company last week, in consequence of personal indisposition, was much to be regretted; but the address given on the occasion by Mr. George Banbury was one which dealt very ably with the position of the Company and the water question generally. The necessity of careful administration in the management of the water supply, was well exemplified by the fact that the increase of nearly £5000 in the revenue had been fully absorbed by the additional expenditure arising out of the high price of coal, coupled with the payment made to the City Chamberlain in compliance with the Act of 1886, and the expenses connected with the proceedings before the Parliamentary Committee on the Water Bills of the past session. The last of these three items was an especially heavy one; but a cheerful view was taken of the result which had accrued from the investigations of the Select Committee, and in the tone of Mr. Banbury's remarks on this subject there was a striking contrast to the report which has recently been presented to the County Council by Sir Thomas Farrer. The latter is a lugubrious document, complaining of endless "difficulties," and charging against Sir Matthew White Ridley's Committee various sins both of commission and omission. On the other hand, Mr. Banbury holds to the opinion that, although the parliamentary campaign has been costly to the Companies, the money spent has not been altogether a bad investment. We remarked last week on the complaint of Sir T. Farrer that the Companies had not given evidence at any of the water inquiries. But Mr. Banbury reminds the East London shareholders that when Mr. Pember offered to produce evidence before the Select Committee, Sir Matthew White Ridley replied: "The "Committee do not see the necessity for it at all; and the "Water Companies will not be prejudiced by the Com-"mittee declining to hear such evidence." Sir Matthew is also reported as making the statement "that nothing "has been alleged which calls for any defence on the "part of the Water Companies." Such an issue is altogether remarkable, considering the nature of the attack to which the Companies were exposed. Concerning the quality of the water supply, there is clearly nothing at all to fear, supposing some future inquiry to be brought to bear on that point. In the course of his speech, Mr. Banbury very appropriately made reference to the letter recently addressed to the JOURNAL by Mr. E. Chesshire—a medical gentleman connected with Birmingham. In his communication to our columns, Mr. Chesshire showed that the London water supply could be abundantly augmented by means of deep wells in the chalk; the quality being at the same time beneficially affected by the blending of water from these wells with that proceeding from the Thames, the Lea, and the New River. Another subject is that of amalgamation; and we are glad to see that this was not lost sight of in Mr. Banbury's address. It was brought before the Select Committee by Mr. Pember, and is a matter which we trust will be duly considered by the Companies. Mr. Banbury clearly sees the value of "the whole or partial amalgamation of the Water "Companies;" and he is hopeful that the difficulties of detail which lie in the way may all be overcome. The financial complications which have to be harmonized are, no doubt, of a perplexing character. But the problem is not insoluble; and amalgamation is only another name for consolidation and strength. We think the Companies will be wise if they resort to it.

An admirable letter by Colonel Makins, on the subject of the London Water Supply, appeared last week in the columns of *The Times;* followed in a couple of days by a communication from Sir Thomas Farrer in the nature of a reply, in which the Vice-Chairman of the County Council showed a singular want of acquaintance with the proceedings of the body with which he is connected, or else a remarkable failure of memory. Colonel Makins made a quotation as to the manner in which the Council considered an arbitrator should proceed to value the undertakings of the Water Companies. In his rejoinder, Sir T. Farrer said: "I do not know from what document "Colonel Makins quotes." Yet, considering the post he

occupies, Sir T. Farrer might have been supposed to know that the quotation was taken from a report presented in February last by the Parliamentary Committee of the Council in reference to the Water Bills then before the House of Commons. But that report was signed by Mr. Charles Harrison; and possibly Sir T. Farrer considered it beneath his notice. Speaking of the quotation, Sir Thomas said in his reply: "There is certainly no such passage in the "recent report of the Water Committee." That report was signed by Sir Thomas himself; and hence it has no connection with the report brought up by somebody else. But the family likeness is very strong, and justifies the complaint of Colonel Makins that, both in February last and at the present time, the policy of the County Council in reference to the purchase of the water undertakings is one of "confiscation." Sir T. Farrer scorns the idea that "the actual income of the Companies is to be preserved "to them without taking into account the future liabilities "of the Companies, whether for new supply or otherwise, "by which that income may be reduced." Sir Thomas may rely upon it that the Water Companies know very distinctly how to estimate their ability for maintaining the supply. It is the Council that is in the dark. The Companies are not afraid of the future, and are not seeking a purchase. Colonel Makins states the situation very correctly when he says: "The Companies have no "desire to sell their undertakings, nor do they desire to "stand in the way of a public authority purchasing them, "if it be for the public interest, on fair terms." Fair terms are those which shall not damage the Companies. But that kind of principle is not accepted at the "County "Hall" in Spring Gardens. The profits which now go in payment of dividends are to be appropriated by the Council; but the dividends are not to be made the subject of consideration in settling the terms of purchase. In other words, the income is to be seized, but part of the capital is to be annihilated. Commencing with an act of spoliation, the Council can go on and prosper. The discussion was resumed in *The Times* yesterday, by a second letter from Colonel Makins. Mr. Beachcroft also writes, directing his remarks to the question of purchase, as affected by Sir T. Farrer's proposal that the value of the Companies' undertakings shall be subject to a consideration of what will be needed "to supply future wants." Mr. Beachcroft very properly argues that if Sir T. Farrer intends the cost of a new supply to be a deduction from the value of the old, the process will be one of "confiscation."

The report of the Special Committee on Water Supply, signed by Sir T. Farrer, its Chairman, came before the County Council last week; but the debate was adjourned. Mr. Beachcroft has given notice of sundry amendments, one of which proposes that, if other modes of dealing with the question fail, consideration should be directed to the suggestion made to the Select Committee, on behalf of the Companies, for amalgamating the eight existing undertakings, placing them at the same time under more complete control, accompanied by increased obligations in regard to supplemental supply. The idea of amalgamation appears to be gaining ground; and its accomplishment would be a sufficient sequel to the present agitation, even if nothing else followed. We cannot suppose that things will remain as they are; and yet there are indications that both London and the Government shrink from the idea of making the water supply the property of the County Council. There are, as signified by the Chairman at the meeting of the East London Company, signs of a reaction on this subject. There well may be, looking at the present condition of the Council. That body appears to be undergoing a process of disintegration. Not only have the Chairman and Vice-Chairman given notice of resignation, but the Deputy-Chairman has done the same; and it is generally believed that a large proportion of the Council will decline to seek re-election. Supposing the Companies to remain in possession of their undertakings, the idea of "more complete control," as mooted by Mr. Beachcroft, raises the question as to whether something of this sort is not needed for the Council rather than for the Companies. The confusion into which the Council is falling—as exemplified by its treatment of the Street Improvement schemes—clearly proves that this body lacks the needful qualification for controlling the Water Companies, with their millions of capital and their enormous responsibilities in relation to the Metropolis.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 679.)

DURING the past week the general tendency in the Stock Markets has been very variable—an alternation of ups and downs; but, on the whole, prices were more disposed to go lower. The recent active buying has sustained a marked check; while many have thought it prudent to realize profits. The position of affairs in several foreign states have unfavourably affected that market; and the influence is felt further afield. But on the whole, business for the week was quiet. The expected advance in the Bank rate did not come off; a cessation to the large demand for gold enabling the Directors to leave it at 3 per cent. a little longer. Business in Gas has been rather more extensive than in the preceding week; and the tendency was decidedly downward. All the leading issues—the three Metropolitan undertakings and the chief Continental—have suffered an appreciable fall. In Gaslights, the "A" opened at 230¾, but failed to touch that figure again, and was done at 226 on Saturday. Of the secured issues, the 6 per cent. debenture was in best demand, and was firm. The "B" 4 per cent. also held very steady; but the 10 per cents, and the "K," receded a point each. South Metropolitans also show continued weakness; and all three issues have had a further fall, although there does not appear to have been much stock parted with. A little business was done in Commercials in the earlier part of the week; but nothing at all later on. The Company held their meeting on Friday, and declared their usual 13¾ per cent. dividend; but not even this fact (coupled with the assurance of its future maintenance, as the Chairman pointed out, by the aid of a 10 per cent. cash reserve) could inspire the meeting with excessive cheerfulness, and the speeches delivered were all characterized by very moderate jubilation. Among the Suburban and Provincial Companies, Alliance and Dublin have recovered the ½ which they lost a fortnight ago; being the only advance in price effected during the week. The Bristol Gas Company's stock is now quoted in our list; and it stands at a choice figure. Of the foreign undertakings, the only one to move was Imperial Continental, which fell 3. The Water Companies are quite without feature. A moderate amount of business was done in them at about average figures; all quotations remaining unchanged.

The daily operations were: Gas opened quiet on Monday; and business was at no time very brisk. Gaslight "A" and South Metropolitan "A" receded 1 each; but Alliance and Dublin rose ½. On Tuesday transactions were not any more extensive; but prices remained steady. There was rather more activity on Wednesday, though it was confined to the leading issues; and prices generally were very fairly up to the mark. Thursday became more quiet; and prices were not so well sustained, except for Gaslight 6 per cent. debentures. The only change in quotation was a relapse of 2 in South Metropolitan "B." On Friday, the market showed symptoms of weakness, especially in the heavier issues; and Gaslight "A" fell 1½. The weakness became more marked on Saturday; and an extensive reduction in quotations took place. Commercial old fell 5; Gaslight "A," 1½; ditto, 10 per cent. and 6 per cent. preferences, 1 each; Imperial Continental, 3; South Metropolitan "A," 5; ditto "B," 3; and ditto "C," 2½.

ELECTRIC LIGHTING MEMORANDA.

The Manchester Corporation Electric Lighting Undertaking—The Manchester Square Station of the Metropolitan Electric Light Company—Messrs. Schuckert and Co. at the Frankfort Exhibition—The Montreal Meeting of the American National Electric Light Association.

IT appears to us that electricians would be justified in complaining of the gingerly way in which the wealthiest Municipalities handle their statutory responsibilities in the matter of electric lighting. Most of the great Municipalities of the North of England are remarkably "touchy" on the subject of their streets. The idea that a company might acquire the right to interfere in any way with the sacred road surfaces of a city where both water and gas are under the control of the corporation, is enough to agitate the members of such a corporation to unwonted depths; and so it came about that some trumpery "House-to-House" electric lighting company, without capital or standing, has only had to threaten to apply for an Electric Lighting Order for any big town, to drive the authorities concerned into reluctant action on their own account. In this way, Glasgow and Manchester, and many other large towns, have been goaded into the acquisition of Electric Lighting Orders which they did not want, and would very willingly have dispensed with, if they had been permitted to warn off electric light speculators until the prospects of this class of industrial enterprise had grown clearer. Rightly or wrongly, however, the Board of Trade gave these Municipalities to understand that they could only hope to keep electrical speculators at bay by becoming speculators of the same kind on their own account. So Manchester obtained an Electric Lighting Order in self-defence; and thereafter quietly let the matter stand over as long as possible. The time came, however, when "something had to be done;" and accordingly the Corporation of Manchester went with most obvious reluctance

to Professor Hopkinson, and engaged him to satisfy the requirements of the Order with the least possible committal of the Corporation to anything beyond the letter of the law. The mains must be laid in the district of compulsory supply before next August; and this can be done easily enough, seeing that the district in question is absurdly limited. The land for the station has recently been bought, however, which is one step in advance; although even in this matter the Corporation have tried to "kill two birds with one stone" by making the same site serve for both the electric lighting and the hydraulic power generating stations. As they are advised by Dr. Hopkinson, it is only to be supposed that the Manchester Corporation would adopt the three-wire system of distribution. But they have induced Dr. Hopkinson to put the voltage up to 400 feet for the leading mains, which is probably the highest on record for such a plant; and he has decided to employ a five-wire system. The object of this, of course, is to save copper, and thereby to further minimize the financial risk run by the Corporation. It is a very half-hearted way of doing business; but seeing that the Corporation do not care for the enterprise at all, and do not expect to see their money back, it is difficult to blame them for not showing greater enthusiasm in the matter.

Our contemporary *Industries* recently published a particular account of the Metropolitan Electric Light Company's Manchester Square station. This is the English station of the Company; their Sardinia Street station being the American one. The difference, however, is only in the motor machinery; the same pattern of water-tube boilers being employed at both places. At Manchester Square, 2000-horse power can be converted into electricity, and the plant, which was designed by Mr. J. E. H. Gordon, is reported to be a model of what a town station should be. How the machinery compares with the Westinghouse plant at Sardinia Street has not been made apparent. The work is distributed among a multiplicity of engines, in order that those which are in action at any time may be loaded up to an economical point; and there is plenty of boiler power to fall back upon in times of extreme pressure. In all probability these times have not come; for, by all accounts, the managers of the West-end electric lighting stations would like to be pushed very much harder than they have yet been, or are ever likely to be this winter.

One of the most instructive of the exhibits at Frankfort is reported to be that of Messrs. Schuckert and Co., of Nuremberg, who show a complete central station plant illustrating the three-wire system for continuous currents, with their simultaneous use accumulators. This appears to be much the same principle as Dr. Hopkinson has adopted for the Manchester Corporation experiment; and consequently it claims attention as being quite the latest thing in electrical distribution. One dynamo generates the electricity; being driven by a directly-coupled engine of 100-horse power. The dynamo is of the flat-ring type; and a characteristic feature of the system is the automatic current regulation, which is effected by switching in or out a larger or smaller number of accumulator cells, according to the varying requirements of the consumers in circuit. This current regulation has hitherto been managed by introducing or removing resistance coils, which simply converted the surplus electrical energy into heat, and wasted it. To be able to use this surplus from time to time for charging accumulators, is therefore a distinct economy; and in electric lighting plant the smallest economy is something to be thankful for. This method of regulation is rendered possible by the fact that the current generated by the flat-ring machine is available either for direct consumption or for charging the accumulator battery, which is of the Tudor pattern. This kind of accumulator is stated to be much used on the Continent, on account of its great efficiency and long life. It would appear, from this description, that the Schuckert firm may claim to be consulted with regard to any central station lighting plant to be laid down in the near future. It may be noticed by the way, as a sign of the times, that no medals or awards of any kind are to be given in connection with the exhibits at Frankfort; but a Committee of experts will draw up a report on the apparatus displayed. In view of the disrepute into which the prize medal system has fallen, the electricians are to be congratulated on their action in this regard.

Of a very different character from the proceedings at Frankport were the doings of the National Electric Light Association of America, on the occasion of their recent meeting at Montreal. This gathering was accounted a grand success, inasmuch as "the citizens of Montreal had made most elaborate preparations for the thorough entertainment of their visitors, and there was a constant round of entertainments of one sort or another all the time the convention was in session." There was an exhibition of electrical machinery in connection with the meeting; but this seems to have been made the medium for displaying the commercial rivalry between the principal American electrical engineering firms, rather than a means of illustrating the scientific aspect of electric lighting. Indeed, some of our electrical contemporaries have permitted themselves to refer in slighting terms to the whole affair, which they consider to have had reasons for its existence of a purely commercial order. Very little science was talked, even at what were called the business meetings; the assembled "electricians" being more interested in discussing "wrinkles" for obtaining custom, for dealing with recalcitrant local authorities, and similar pressing matters, than in considering abstruse problems of electrical measurement and the like. It appears that the American electricians are, as a body, very like their compatriots of the gas industry—clever men in their way, and as good technicians as their opportunities permit; but when the most energetic of men has to keep one eye upon a business rival and another on a gang of ward politicians, how is he to abstract his attention from these cares for daily bread, in order to penetrate the arcana of pure science?

WATER ACTS OF 1891.

We have already given a summary of the Acts passed last session in relation to the supply of gas, and now deal with those relating to water supply, water-works extensions, &c.

The Bognor Water Act incorporates a Company who obtained a Provisional Order in 1875, authorizing them to construct works for the supply of water to the town of Bognor and the parishes of South Bersted and Felpham in Sussex. The capital of the Company was fixed at £10,000, of which £8950 was called up, and £6000 raised on mortgage. The Act enlarges the limits of the supply district, and increases the capital to £50,000, whereof £41,050 is to be new, not more than one-half of which may be issued as 5 per cent. preference capital. Borrowing powers are conferred to the extent of one-fourth of the paid-up capital, to include the old mortgage debt. The source of supply is to be a well on the boundary of the parishes of Merston and Oving; and all works are to be completed within four years. It is enacted, for the protection of the Duke of Richmond and the Ecclesiastical Commissioners, that the Company shall not take water from any bed of gravel overlying the clay above the chalk formation. The rate for domestic supplies is to range from 7 to 5 per cent. The Market Drayton Water Act incorporates a Company with a capital of £8000, and power to borrow £2000 in respect thereof, for the supply of water in the parish of Drayton-in-Hales, in the counties of Salop and Stafford. The source of supply is to be from boreholes on the Meynell-Ingram estate; and the works are to be completed within five years. Rates are to range from 7½ to 5 per cent., with the former rate for all inns. The Western Valleys (Monmouthshire) Water Act incorporates a Company with a capital of £40,000 and power to borrow £10,000, for supplying water to a district comprising certain portions of the parishes of Bedwellty, Mynyddislwyn Risca, and Machen, in Monmouthshire. The source of supply is an intake from the Nant-y-Felin Brook, in the parish of Bedwellty. Various protection clauses are inserted in the Act at the instance of landowners and railway companies. The rates for domestic supplies are to range from 10 to 6 per cent.

The Falmouth Water Act enables the Company to acquire certain mill properties towards which they lie under statutory obligations, and to extinguish the latter. The capital of the Company is also to be increased by the issue of new shares, which, whether preference or ordinary, are not to bear more than 6 per cent. dividend. The new issue may be ranked with existing preference stocks; and the whole of such stocks may be consolidated by concurrence of the stockholders and the Company. The Company's borrowing powers are increased by £9000. The Filey Water and Gas Act contains clauses extending the limits of water supply and increasing the water capital by £15,000, to bear 7 per cent. ordinary, or 5 per cent. preference dividend. The Fylde Water Act is to enable the Company to raise £100,000 of new capital, to bear 5 per cent. ordinary, or 4 per cent. preference dividend, with power to borrow £25,000. New pipe-lines are authorized, and certain waters are required to be filtered, and a reservoir to be cleansed and thereafter kept clean. A stringent clause is inserted for the prevention of trespass by any servants of the Company upon the lands of the Earl of Bective. Ten years are allowed for the construction of the new works. Certain mill-owners are restrained from taking more than a defined quantity of water, for engine purposes only, from the Calder River; and the proprietors of some paper-mills are ordered to filter their effluent water before it is discharged into that stream. The Southwark and Vauxhall Water Act authorizes the Company to increase their capital by issuing new debenture stock to the amount of £300,000, not bearing more than 4 per cent interest. It is enacted that from and after the expiration of three years from the issue of any debenture stock, there shall be carried to a sinking fund such percentage on the amount as, with the premium, shall be equal to the excess of the average percentage of the dividend or interest paid for that year on all the capital of the Company, whether share or borrowed, above the interest, together with an additional 1 per cent. per annum added thereto for management, on such debenture stock; this sinking fund to be held and applied by the Chamberlain of the City of London as trustee for the purpose of purchasing shares or stock of the Company and of investing the dividends thereon with a view to ultimately extinguishing the capital, or for such other purposes as Parliament may from time to time determine. The newly-authorized capital is to be applied for the following purposes: For filtering works, £30,000; for further storeage at Nunhead, £85,000; for additional engine power, £40,000; for finishing the works at Streatham, £30,00; for the

completion of the high-pressure service, £20,000; for the extension of mains and services, £40,000. The Sunderland and South Shields Water Act authorizes the Company to raise £500,000 of new 5 per cent. capital, with power to borrow £125,000 thereon. Four new pumping stations and the necessary storeage and distribution works are authorized—all to be completed within 15 years. The Corporations served by the Company are to be supplied with water for all purposes at a price not exceeding 5d. per 1000 gallons.

The Barmouth Local Board Act contains a division relating to water supply, and authorizing the construction of water-works by the Board, comprising an impounding reservoir for the waters of Llyn Bodlyn, situate in the parish of Llanddwywe upon the Ysgethin stream, discharging 480,000 gallons of compensation water daily, under a £5 penalty. The works are to be completed within seven years. The rate for domestic supplies to be 10 per cent. on the rateable value. The sum of £20,000 is to be borrowed for the purpose of constructing the authorized water-works. The Northallerton Water-Works Act enables the Local Board to construct water-works comprising an impounding reservoir, an intake at a spring in the parish of Osmotherly, &c., and to borrow £14,000 for the purpose. The works are to be completed within five years. The district of supply is to include the townships of Brompton and Romanby in the parish of Northallerton, as well as the district of the Local Board, subject to certain conditions, including the right of the Northallerton Rural Sanitary Authority to purchase the portion of the undertaking lying within their own limits. The Thirsk District Water Company are still to supply the North-Eastern Railway Company until the Local Board are ready to do so at the price paid by the Company in 1890; and if the Board should be unable to continue the supply at this figure, then the Thirsk Company may resume their service as before the passing of the Act. The Local Board are not to begin to supply water until the authorized impounding reservoir shall be constructed of a capacity of 15 million gallons, and there is being discharged into the drainage streams a certified bulk of water by way of compensation. Elaborate provision is made with regard to the flow of this water. The rates for domestic supply are to range from 7½ to 5 per cent. The Newark Corporation Act empowers the Corporation to purchase the undertaking of the local Company, in consideration of the payment of £10,000, and the issue of 7 per cent. annuities to the amount of £14,000, to be redeemable after Sept. 29, 1892, at the price of £200 per cent. of the capital represented. The lump sum of £10,000 is to be applied in payment of the Company's debts and liabilities of every kind, including compensations. The works authorized comprise a well and drift in the parish of Farnsfield. Rates for domestic supply range from 8 to 5 per cent. Water sold by meter is to be charged for at from 2s. down to 8d. per 1000 gallons, according to quantity. The Corporation are authorized to borrow such amounts of money as they may require for the acquisition of the undertaking and the redemption of the annuities, together with £56,034 for the construction of new works, and £20,000 for new water mains and services. Outlying portions of the undertaking are to be sold off to the local authorities interested in them, if the latter should so desire.

The Alloa Water Act authorizes the Police Commissioners of the burgh of Alloa to provide an additional water supply to the burgh and places adjacent, and to enlarge their existing works by the construction of an impounding reservoir on the Gartreilly Burn, in the parish of Clackmannan, by the enlargement of the existing reservoir called Gartmorn Dam, and by the addition of certain pipe-lines. Compensation water is to be given, under stated conditions. The works are to be completed within seven years. The amount of the domestic rate is to be assessed in accordance with the requirements of the Commissioners, under certain rules; it being provided that such rate is not to exceed the estimated expenses of carrying on the undertaking. The Commissioners may borrow any sum not exceeding £60,000 for the purposes of the Act. The Dundee Water Act empowers the Water Commissioners of Dundee to raise £150,000 for the extension of their water-works. The authorized extensions consist of an enlargement of the Linthrathen reservoir, so as to increase its area, and raise the water-line 4 feet, which entails a number of road diversions and similar subsidiary works. This reservoir is to collect the waters of the Lintrathen Lock, the River Melgum and its effluents, and the Inzion Burn, all in Forfarshire. The amount of compensation water to be discharged down the course of the impounded streams is corrected to 7½ cubic feet per second. The authorized works are to be completed within ten years. The limits of supply are also extended. The relations of the Commissioners with the Parish Board of Monifieth are re-adjusted; and the constitution of the Board of Commissioners is reformed. The Keighley Corporation Act extends the time fixed by the Keighley Provisional Order of 1879, for the construction and completion of certain works authorized in 1869, to ten years from the passing of the Act. New filter-beds are to be made, and certain arrangements with millowners are to be modified. The sum of £130,000 may be borrowed for the completion of the authorized water-works. An agreement between the Keighley Corporation and the Haworth Local Board for the supply of water to the latter at the price of 6d. per 1000 gallons is scheduled. The Llanelly (Local Board) Water-Works Act empowers the Local Board to construct an additional storeage and service reservoir upon the River Lliedi, at Gellifechan, for which purpose the Board are authorized to borrow £70,000. The Malvern Water Act confers upon the Malvern Local Board power to construct an additional storeage reservoir upon a stream flowing through Rabbit Warren Farm, in the parish of Little Malvern; discharging compensation water at the rate of 28,000 gallons per day. In 1871 the Local Board were authorized by an Order to charge for water supplied for domestic purposes by meter; but this is repealed by the Act in favour of a water-rate of 10 per cent. The sum of £60,000 is to be borrowed for water-works purposes.

The Mountain Ash Local Board Act enables the Board to raise £17,000 for the construction of additional water-works, and £10,000 more with the consent of the Local Government Board. The time limited by an Act of 1886 for the completion of the works authorized by that Act is extended to June 25, 1894. The Penmaenmawr Local Board Act enables the Board to raise £9000 for the purposes of their water undertaking, and more if required, subject to the sanction of the Local Government Board. The Board are authorized to construct an additional reservoir upon a stream tributary to the Afon Gyrach. Before doing so, they are to pay £2000 as compensation to a property-owner for his interest in the impounded waters. The works are to be completed within ten years. The rates for domestic supply are to range from 7½ to 6½ per cent.

The Chicago Gas Club, to which reference was made in our editoral columns a few weeks ago, was duly organized on the 23rd ult., at a meeting held at the Grand Pacific Hotel, Chicago. About sixty gentlemen interested in gas affairs have joined the Club, of which Mr. E. G. Cowdery, of Milwaukee, is the temporary President; and Committees to report a set of laws and nominate officers have been appointed, with instructions to hand in their conclusions at the next meeting, which was named for an early date. The Club is to be social; but probably, after the members get to know each other, business matters will be discussed informally.

American Gaslight Association.—Active preparations are in progress for the forthcoming annual meeting of this Association, which will take place in New York on the 21st inst. and the two following days, under the presidency of Mr. John P. Harbison. The preliminary circular which has been sent to the members by the Acting Secretary (Mr. Alex. C. Humphreys) states that seven papers have been promised. They are as follows: "Leakage," by Mr. C. H. Nettleton, of Birmingham (Conn.); "Meter-Rent—A Question of Policy," by Mr. Walton Clark, of Philadelphia; "The Illuminating Power of Mixtures of Coal and Water Gases," by Dr. E. G. Love, of New York; "Theoretical Effect of Pre-Heating Blast, Steam, and Oil, in the Manufacture of Water Gas," by Mr. Rollin Norris, of Philadelphia; "Lime," by Dr. A. W. Wilkinson, of New York; "Intensity of Light," by Mr. A. B. Slater, jun., of Providence (R. I.); "The Manipulation of Tar from Carburetted Water Gas," by Mr. D. Douglas, of Savannah. In addition to these, there will probably be a large quantity of material in the "Question-Box," which will doubtless give rise to some useful discussions. There is every prospect of the New York gathering being both profitable and pleasurable to those who are able to attend it.

Street Lighting in the United States.—Our American contemporary *Light, Heat, and Power* gave in a supplement to a recent issue a tabulated statement, taken from the Census Office returns, showing the statistics of street lighting for the last census year in each of fifty of the largest cities in the United States which had made complete returns. The figures included the length of streets, total number of lamps (divided as to gas, electric, vapour, and oil), average annual cost of lighting, number of lamps to each mile of street and each square mile of area, with the yearly expense of each lamp and class of lamp per head of the population. The cost of each gas-lamp per annum varies from $50 in New Orleans, $43.80 in San Francisco, and $37 in St. Louis, to $17.50 in Hoboken, $15.60 in Minneapolis, and $15 in Indianapolis and Canton. The annual cost of each electric lamp varies from $440.67 in San Francisco and $237.25 in Boston to $58.46 in Denver and $68 in Chicago. In cities having more than 100,000 inhabitants, the average number of lamps to each square mile is 219, or 13·5 to each mile of street; the number of population to each lamp being 47, and the average annual cost of street lighting per head of population 67c. In cities having less than 100,000 inhabitants, the number of lamps per square mile is 62, or 3·8 to each mile of street; the number of population per lamp being 71, and the annual cost per head 65c. A condensed table of 309 cities, with a population aggregating 16,335,569, furnishes the following instructive figures: Lamps—Gas, 182,671; electric, 53,696; oil, &c., 57,480—total, 293,847. The number of population to each lamp is 56; the average annual cost, $10,390,147; the cost per head of the population, 64c. The foregoing figures show that gas-lamps comprise more than 60 per cent. of the total number used for street lighting; though, of course, they are rarely employed exclusively for this purpose. Electric lighting appears, from the figures contained in another table, to be favoured in cities having less than 100,000 inhabitants. Taking a group of 278 of such places, out of a total of 91,467 lamps in use, 35,127 are gas, and 35,191 electric; the remainder being oil.

NOTES.

A Heavy Main Alteration.

During the past few weeks a very heavy and important trunk main alteration has been carried out under the supervision of Mr. G. F. L. Foulger, Chief Distributing Engineer of The Gas-light and Coke Company, by the workmen of his department. The two 48-inch high-pressure trunk mains from Beckton to the central districts of London pass through a subway underneath the Liverpool Street Station of the Great Eastern Railway Company; following the line of Brushfield Street. The level of the permanent way of the station is about 20 feet below that of the roadway surfaces of the neighbourhood; consequently necessitating a vertical drop in the gas-mains outside the station walls, in order to attain the depths of the subway. The Railway Company are extending their terminus from the present building southward to Bishopsgate Street; thereby requiring the prolongation of the gas-main subway in the same direction, and the lowering of the pipes for the same distance to their new bed 25 feet below the original level. This involved the cutting out of the heavy connections at the original subway end, and their reinstatement in the fresh place. In the execution of the work, the mains were first slung from whole cross timbers, while a trench was undermined beneath them and the invert of the new subway built. As every pipe weighs upwards of 3 tons, and the special pieces even exceed this weight, this part of the work required very great care. When the subway was ready for the reception of the mains, they were cut, one at a time, early on a Sunday morning, when the draft from Beckton was at its lowest. The gas in the live portion of the pipe to be cut was shut off at the nearest valve, and again close to the point of severence, by two gas-bags, provided with a ventilating-pipe between. The new joints were run solid with lead. Notwithstanding the difficulties due to the weight of the connections, the necessity for providing against accidents, and the shortness of the time during which the flow of gas could be interrupted, the work was done without a hitch; and the mains are now carrying their gas as usual in the new situation. It is an interesting fact to note that, during the business hours of a winter's evening, these mains convey gas pumped into them at a pressure of 220-10ths. Some of the gas thus conveyed into London is stored in separate holders at the eleven manufacturing and nine distributing stations of the Company; and the rest is sent directly into the supply-mains through reducing governors.

An Ammonia Engine.

It is reported that a new start has been made, with promise of success, in the utilization of ammonia for heat-engines. Messrs. J. H. and C. H. Campbell, of New York, have invented an ammonia motor, which is stated to be running with good results, in a tug-boat plying in New York Harbour. The opening for an ammonia engine lies in the fact that, for the same expenditure of heat, ammonia gas will develop higher pressure than steam. In the Campbell engine, steam is raised in a boiler, as usual; but the heat of the steam is employed secondarily to vapourize aqua ammonia in a separate boiler. The liberated ammonia gas is used in a compound engine of ordinary pattern, and is afterwards condensed and re-absorbed by water. An economy of 50 per cent. of fuel is claimed for the system; and there are numerous consequential advantages, not the least of which is the perfect lubrication of the motor cylinders without oil, and the consequent enhanced endurance of the boilers and machinery in general. Mr. Campbell claims that the old idea that ammonia cannot be kept in a power generator without waste, is erroneous. The fitting must be good, of course; and no copper or brass allowed to come into contact with the gas. For marine engines, the aqua ammonia is preferably vapourized with the aid of steam; but the full capabilities of an ammonia engine will only be developed on shore when gas heat is used for this purpose.

Nozzles as Water-Meters.

According to a paper contributed by Mr. John R. Freeman to the American Society of Civil Engineers, for measuring the discharge of water in moderate quantity and under considerable pressure, a simple smooth nozzle, to which an accurate pressure-gauge is properly connected, forms an apparatus of great convenience and remarkable accuracy. For instance, the discharge of a pump delivering its water at a pressure anywhere from 5 lbs. per square inch upwards can be metered by this means with an accuracy and convenience not exceeded by a weir or by any method known, providing that for the case in question it is allowable to discharge the water in the form of a jet into the air. The paper, which is published in the "Transactions" of the Society for June last, is mainly devoted to an account of some experiments with certain nozzles up to 2½ inches diameter, made for the purpose. The experiments demonstrate, first, that the coefficient of discharge of any particular nozzle may be determined with a very high degree of precision, and is practically constant for all ordinary pressures; secondly, they indicate that a substantial variation in the method of connecting up the nozzle to its supply-pipe would cause little or no error in measuring the discharge; and thirdly, the experiments show that, to meet any special purpose, a nozzle can be readily constructed as a copy of another nozzle which has been tested or calibrated, and its coefficient of discharge can be assumed from the model without the necessity of testing or calibrating it.

COMMUNICATED ARTICLE.

LIGHTING.

By W. H. Y. Webber.

PART I.—THEORY.

(*Continued from p.* 618.)

There is still more to be said on this subject of reflection. Regular reflection from polished surfaces is susceptible of calculation according to the laws of optics; and a considerable portion of every text-book upon Light or Optics is devoted to these computations. Although regular reflection does not enter much into problems of ordinary lighting, it is necessary, in any useful memoir upon the latter branch of the subject, to take account of the manner in which direct merges into indirect reflection. Perfect reflectors do not exist; but highly-polished metallic specula are the nearest approach to opaque bodies perfectly reflecting incident light. The imperfection of polish is the principal cause of the imperfect reflection that all mirrors exhibit more or less; the amount of it increasing as the degree of polish drops. When, therefore, light falls upon any imperfectly polished and opaque surface—that is to say, upon any known surface whatever—it is disposed of in three ways: (1) A part is regularly reflected, and forms the optical image of the object from which it proceeded; (2) a part is irregularly reflected, and renders the surface of the reflector perceptible; (3) a part is absorbed by the surface, and consequently is not reflected. The smaller the proportion of light that is subjected to the two last-mentioned effects, the more perfect will be the reflector.

The quantity of light regularly reflected by a given surface also varies with the angle of incidence. When this is *nil* (the light falling perpendicularly upon the surface), a less proportion of it is regularly reflected, and a greater proportion is irregularly reflected and absorbed, than when the angle has some magnitude, and consequently the light falls more or less obliquely. Generally speaking, whatever the nature of the surface, as the angle of incidence increases (*e.g.*, departs from the perpendicular), the quantity of light reflected *regularly* is augmented; and that which is reflected *irregularly* and *absorbed*, is diminished.

A table has been compiled by Bouguer showing the proportions of light reflected regularly, and reflected irregularly and absorbed, from a few surfaces—including water, glass, polished black marble, and metallic specula—from which the following data are abstracted. The initial amount of incident light is always 1000. R = regularly reflected; R'A = irregularly reflected and absorbed.

Angle of Incidence.	Minimum of Rays Reflected.							
	Water.		Glass.		Black Marble, Polished.			
	R	R'A		R	R'A		R	R'A
0° to 30°	18	982	..	25	975	..	23	979
60°	65	635	..	112	888	..	51	949
75°	211	789	..	300	700	..	156	844
80° 45′	—	—	..	—	—	..	600	400
85°	—	—	..	543	457	..	—	—
89° 30′	721	279	..	—	—	..	—	—

Freshly-fallen snow reflects 78 per cent. of light; white paper, 70 per cent.; white sandstone, 24 per cent.; ordinary earth, road surfaces, &c., 8 per cent.

The angle of incidence has often so much effect upon the regular reflection of light, that it will sometimes happen that a surface which reflects no light regularly when the angle is *nil*, reflects a considerable quantity when it is large. Thus the surface of unpolished glass does not produce any image of an object by reflection when the rays fall on it nearly perpendicularly; but if the flame of a candle be held in such a position that the rays fall upon the surface at a very small angle, a distinct reflected image of the candle will be seen. Similar phenomena are presented by other kinds of surfaces.

When light is incident upon the surface of a transparent body, such as glass or water, it is disposed of as follows: (1) A part is regularly reflected, and produces an optical image of the object from which the light proceeds; (2) a part is irregularly reflected, and renders the surface visible; (3) a part is absorbed, and consequently neither reflected nor transmitted; (4) a part is transmitted through the transparent medium. "If light be incident upon the surface of a transparent medium bounded by parallel surfaces, such as a flat plate of glass, all the circumstances above mentioned will take place both at its entrance at the one surface and its escape from the other. Light will be reflected regularly and irregularly at both surfaces; light will be absorbed at both, and light will be transmitted from both. The quantity of light, therefore, transmitted in such a case from the second surface will be less than the quantity of light incident upon the first surface, by the sum of all the light regularly and irregularly reflected from the first surface, and all the light regularly and irregularly reflected from the second surface, and all the light absorbed at both surfaces in its transit through the medium."

The foregoing is an abstract of what Dr. Lardner has to say on the subject of lighting by radiation and reflection and it will

be seen that much of it bears very intimately upon phenomena of constant occurrence in the artificial lighting of open spaces and interiors.

The chapters on "Light" in Dr. Atkinson's translation of Ganot's "Elementary Treatise of Physics" (twelfth edition) also contain some clearly-expressed information on this subject. In this work the laws of the Intensity of Light are stated as follows: (1) The intensity of illumination on a given surface is inversely as the square of its distance from the source of light. (2) The intensity of illumination which is received obliquely is proportional to the cosine of the angle which the luminous rays make with the normal to the illuminated surface. It will be noticed that this is, in the case of the second law, a different way of stating the same truth to that adopted by Lardner. Thus stated, it is called by all modern writers "the law of the cosine;" and it is the method now adopted, for the sake of uniformity, of expressing the angular incidence of light falling obliquely upon a surface. (There is no disagreement between this way of stating the case and that of Lardner; for the sine of an angle is equal to the cosine of its complement.) Atkinson observes that the illumination of a surface placed in a beam of parallel luminous rays is the same at all distances *in a vacuum*. In air and in other transparent media the intensity of light decreases, in consequence of absorption, more rapidly than the square of the distance.

The second law of intensity corresponds to that which prevails for heat. It may be theoretically deduced as follows: "Let DA, EB (fig. 2) be a pencil of parallel rays falling obliquely on a surface AB, and let *o m* be the normal to this surface. If S is the section of the pencil, *a* the the total quantity of light which falls on the surface AB, and I that which falls on the unit of surface—that is, the intensity of illumination—we have $I = \frac{a}{AB}$.

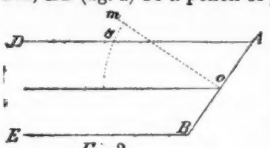

Fig. 2.

But S is only the projection of AB on a plane perpendicular to the pencil, we know from trigonometry that $S = AB \cos. a$, from which $AB = \frac{S}{\cos. a}$. This value substituted in the above equation, gives $I = \frac{a}{S} \cos. a$—a formula which demonstrates the law of the cosine; for as *a* and S are constant quantities, I is proportional to cos. *a*." This statement is a considerable advance on Dr. Lardner's elementary style.

More comprehensive treatment of the subject still is given by Parkinson ("Optics"), who combines the two laws of intensity in one expression, and states the proposition that when both the distance and the angle of inclination vary together, the illumination at any point of the area

$$\propto \frac{\text{cosine angle of incidence}}{(\text{distance})^2}$$

Wherefore the illumination at any point of the area is equal to

$$C \frac{\text{cosine angle of incidence}}{(\text{distance})^2}$$

where C depends only on the brightness of the illuminating point, and is the illumination at any point of a small area directly opposed to the pencil at a distance *unity* from the origin.

Luminous surfaces appear to be of the same brightness at any point, whatever be the inclination of the surface at that point to the axis of the pencil by which it is seen. "The sun's disc, for example, is equally bright at all distances from the centre. The apparent intrinsic brightness of a bar of red-hot iron is not sensibly altered by inclinining it obliquely to the eye." The apparent intrinsic brightness is therefore the same at all distances, which must be understood only of apparent intrinsic brightness (of the light-source itself), and the truth of which supposes no loss of light by absorption to take place in the media traversed. This law accounts for the fact that, within a considerable limit of distance, all the gas-lamps lighting a street appear equally brilliant to the eye when directly viewed from a direction nearly in the line of the length of the street.

The next writer to treat geometrically in a style of rising comprehensiveness of the phenomena of lighting is Heath ("Geometrical Optics") who expands the propositions of Parkinson, and enables the student to determine how, if a horizontal surface is illuminated by a source of artificial light at a given horizontal distance *a*, the height of the flame from the table which will give most light upon the surface is equal to $\frac{a}{\sqrt{2}}$.

The latest authority upon the Theory of Light is Preston, whose book, published in 1890, was designed to carry the study of the subject down through the newest discoveries. He has, however, nothing to add to the theory of lighting; but he expresses Kepler's law in terms consonant with the wave theory.

Of French writers upon illumination, we may refer to Moutier ("Cours de Physique," Art. "Optique"); Jamin et Bouty ("Cours de Physique"); and Verdet ("Œuvres"). Moutier, after explaining the laws of intensity in the manner already stated with reference to English writers, goes on to say: "When an object is lighted by a luminous source of very small dimensions, or by a luminous point, the distribution of the light upon this object is ruled by a simple question of geometry. Let us consider, for example, the very simple case of a plane surface. A plane P P (fig. 3) is lighted by a lumious point A; how does the intensity of this light vary in any point of the plane? Let *r* be the distance from the luminous point A to a point *m* of the plane, and *a* = the angle of incidence. The intensity of the light at the point *m* of the plane is

$$i \frac{\cos. a}{r^2}$$

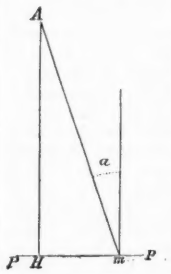

Fig. 3.

If we express by *h* the height A H of the luminous point from the plane P P, we have $h = r \cos. a$. The intensity of light at the point *m* is $i \frac{h}{r^3}$. The intensity of the light at a point of a plane lighted by a luminous point is inversely proportional to the cube of the distance from the illuminated point to the source of light." Verdet adds to the fundamental laws of geometrical optics the statement that when a point is simultaneously illuminated by many luminous points, the total lighting effect is always equal to the sum of the lighting produced by all the points taken separately. He also demonstrates that the simple law, of the intensity varying according to the square of the distance, is only applicable when refraction and reflection do not interfere with the regular radiation from the luminous point.

(To be continued.)

Alderman John Ross Foord has been elected to fill the vacancy on the Board of Directors of the Chatham, Rochester, Gillingham, &c., Water Company, caused by the death of the late Alderman Wildash Foord, recently noticed in our columns. Alderman J. R. Foord is Chairman of the Gas Company, and a Director of many other local companies.

Death of Mr. S. Prichitt.—We regret to record the death, on the 21st ult., after an illness extending over five years, of Mr. Samuel Prichitt, President of the Nashville (Tenn.) Gas Company. He was a member of the American Gaslight Association, and also of the Western Association; and was known and respected by all his colleagues in the gas industry.

Suicide of the Clerk of the Deal Gas and Water Companies.—On Monday last week, Mr. George Mercer, a member of the firm of Messrs. Mercer and Edwards, solicitors, of Deal, committed suicide while in a state of temporary insanity. The deceased was Clerk to the Deal Gas and Water Companies, as well as being Town Clerk and the holder of many other public offices in the district. He had a very large circle of friends, who deeply deplore the sad termination of a long and honourable career. He was 73 years of age; and his mental faculties became impaired through a partnership dispute, which involved a serious financial loss.

The Cost of Lighting in Madrid.—An interesting series of articles has recently appeared in the *Revista Minera*, in which the relative cost of lighting by petroleum, gas, and electricity is fully gone into, and in which an endeavour has been made to prove that electricity is at present the most economical means of illumination in Madrid. The relative cost of the three illuminants is given as follows: Petroleum, per pint—Madrid, 5d.; London, 1d. Gas per 1000 cubic feet—Madrid, 9s. 4d.; London, 2s. 9d. Electricity per 1000 watts—Madrid, 1s.; London, 7d. It will thus be seen that the proportion which the cost in Madrid bears to that in London is as follows: Petroleum, 5 : 1; gas, 3¼ : 1; electricity, 1·7 : 1. The figures below show the cost per month of a light of 10-candle power, based on an assumption that the light would be required on an average for five hours per day: Petroleum—Madrid, 4s. 3d.; London, 10d. Gas—Madrid, 6s. 6d.; London, 2s. 1d. Electricity—Madrid, 5s. 3d.; London, 3s. If this table may be taken as correct, it will be seen that, while gas can be supplied much more cheaply than electricity in London, it is not so in the case of Madrid.

The Price of Gas in Brussels.—The Municipal Council of Brussels, at their meeting on Monday last week, had before them two propositions relating to the charge for gas in the city. The first was submitted by M. Allard, and was to the effect that, inasmuch as the present system of supplying day and night gas through double-index meters, at the rates of 10c. and 14c. per cubic metre respectively, is not altogether satisfactory, gas for heating and lighting purposes should, after a date to be fixed, be supplied at the above-named rates to consumers who will undertake to put in two sets of pipes and two meters, and submit to their inspection by the proper authorities. M. Richald brought forward a counter-proposition to abolish double-index meters altogether, and reduce the price of gas to 12c. per cubic metre, irrespective of the purpose to which it might be put. It was pointed out that it was owing to the introduction of these meters by M. Wybauw that the consumption of day gas had greatly increased; and that the question of bringing the price back to a uniform figure was a very important one to be considered. In the result, the two propositions were referred to the Finance Department and to the Gas Committee.

TECHNICAL RECORD.

RETORT CHARGING AND DISCHARGING MACHINERY FOR GAS-WORKS.

At the Meeting of the Society of Engineers, held at the Westminster Town Hall, yesterday week—the PRESIDENT (Mr. W. N. Colam) in the chair—a paper was read by Mr. HENRY O'CONNOR on the above subject. The following is an abstract of the paper and of the discussion to which it gave rise.

In his opening remarks, Mr. O'Connor said he did not intend to occupy the time of the meeting with any detailed description of the earlier forms of machines for stoking gas-retorts which had been suggested by different engineers from the time of Murdoch. This had been done in a far better style than he could pretend to do by Mr. John Somerville, in a paper read before the Society in 1873, in which were described all the principal arrangements that had been introduced up to that date. In 1875 the late Mr. F. W. Hartley read a paper mainly upon Mr. John West's earlier design of a machine stoker to work by manual power; but from that time to the present, no record had been made in the proceedings of the Society of the various systems which had since been tried. There was no doubt that stoking machinery in all but the smallest works was a means of saving money, and was, on that account, every day becoming more general in its use. The rivals to gas, and the necessity of reducing the cost of manufacture to the lowest point, had made gas engineers thoroughly alive to the importance of this labour-saving appliance; and, in a very large number of works, machine-stokers—some worked by power, and some by hand—were employed. The result was that the harder part of a stoker's work was done away with, and the time necessary for the instruction of workmen considerably reduced. These last points were of great importance at the present time, as, during strikes, new men could be brought to the works and quickly given the necessary teaching to enable them to operate the machines, and to take the place of those who had left.

Any appliance, said the author, which reduced manual labour and at the same time tended to increase the yield of gas per ton of coal, recommended itself to gas engineers, more especially when this could be done at a reduced cost. In a statement made by Mr. J. West, of Manchester, at the meeting of The Gas Institute last year, the estimated saving by the use of his machine was shown as varying from 1·34d. at Cheltenham to 2d. at Maidstone and 2·7d. at Richmond, per 1000 cubic feet, though several engineers who had the machines in use placed the saving at about 10d. per ton. The difference between these statements was accounted for, Mr. O'Connor thought, by the fact that Mr. West showed the difference between the actual cost with machinery and the estimated cost at the present time by the old system; while the other gentlemen compared the cost before machinery, eight-hour shifts, and increased wages were introduced, with the cost with machinery and these extras. The reduction, taken at either figure, showed an important saving, though the author did not believe these figures represented the total gain by the employment of machinery. That a considerable increase in the quantity of gas produced per ton of coal was obtained was a well-known fact; this probably being due to a more even distribution of the coal in the retort, and the more rapid method of discharging the coke and recharging the retort with coal—saving loss of heat by the lids being closed more quickly, and besides, in the case of West's machinery, the coal was broken small, and was thereby more easily and thoroughly carbonized. One thing which had prevented the more extended adoption of machinery was that many retort-houses were so restricted for space that a sufficient distance was not available between the mouthpiece and the back wall. This, in Mr. O'Connor's opinion, should be more than 20 feet, though he knew there were cases of machinery being in use where there was a space of not more than 19 ft. 6 in., and at one works only 19 feet. Another detrimental point was the widely differing shapes and sizes of the retorts and mouthpieces used in various works; and this made it imperative that the machinery should be specially designed for each works. The shape of the mouthpieces was a very important item where machine-stokers were to be employed. At the present time Ω and oval retorts were nearly the only shapes used; and in many cases, to ensure a tight joint when the lid was closed, the front of the mouthpieces was made circular. In such a case the opening on the level of the bottom of the retort should be at least the same width as the retort at that point, or, on withdrawing the caked coke, it would frequently become jammed into and choke the mouthpiece—thus impeding the work and causing extra labour. This was the case whether machinery or hand labour was employed; but with the former the great power had been known to draw off not only the coke, but also the mouthpiece. This point should therefore be borne in mind by engineers when ordering new mouthpieces, whether or not they intended using machinery.

Referring to the labour question as an argument in favour of the employment of machinery, the author said that stokers were certainly quieter last winter, which was no doubt due to the increase in wages and to a general disposition to accede to their requests. At the same time the determined stand taken by Mr. George Livesey and the South Metropolitan Gas Company during the memorable strike of 1890, must have shown that unjust demands would not be granted. The large amount now paid on this account had left its mark on the returns of all gas companies, and should be a strong argument in favour of adopting machinery to reduce the quantity of labour required in the retort-house. That most of the machinery now devised for the purpose was too complicated, and therefore more likely to get out of order, could not be denied. This was a serious defect in such a place as a retort-house, where so much dust abounded, and that dust of so cutting a nature as to clog and rapidly wear out the machines. Many engineers were also deterred from recommending to their directors the adoption of mechanical stoking by the fact that the machines were much too elaborate.

In his Inaugural Address to the Southern District Association of Gas Engineers and Managers this year, Mr. Methven, the author pointed out, suggested the use of machinery principally during the winter months, to obviate the necessity of taking on a large number of fresh hands, and thus to keep the same men on summer and winter. This was a decidedly novel notion, and one likely at first sight to recommend itself to gas managers generally. But the advantage must be compared with the saving effected when the machines were in use all the year round, and the cost for interest and wear and tear had been divided over the whole twelve months. Then the author feared that, if a large number of men were being kept on, and paid to work by hand while the machines were idle, when only half the number would be required if the mechanical stokers were in use, would deter engineers from adopting this method. If machinery was useful and effected a saving, and at the same time obtained more gas of a given quality from a ton of coal during the winter months, it would seem that it should be employed all the year round. It would appear advisable rather to obtain enough machinery to do all the summer work, if not more; so that it might be worked continuously and the advantages realized throughout the year. This might necessitate the connecting of the different retort-houses by lines of rails, so that the machines could be shifted from one house to another as required. In some works—notably those at Birmingham—machinery was used only for the purpose of drawing the coke from the retorts after carbonization. At the works mentioned four of these drawing-machines of the pattern invented by Mr. Ross, of America, and introduced into this country by the late Major Dresser, had been in use since 1885. Mr. Charles Hunt, the Engineer of the works, who had expressed his satisfaction at the work done by them, stated, at the meeting of the new Institution of Gas Engineers, that the cost of drawing by machinery and charging by hand in the usual manner was about 10d. per ton. Mr. Hunt's experience of the Ross charger was that the coal was required to be of a uniform size; and the cost of breaking and raising it to the hoppers precluded its use in his works.

The author then proceeded to explain, by the aid of diagrams, some of the systems of drawing and charging retorts which have been suggested and tried since 1873. [Most of the machines alluded to have been described and illustrated from time to time in our "Register of Patents;" and therefore all we need do here is to mention some of their salient features, and to refer to the numbers of the JOURNAL, in which full notices of them may be found.] Mr. Foulis was, said Mr. O'Connor, the first to introduce hydraulic power for the purpose of mechanical stoking;[1] and the system had several advantages over the other methods of supplying motive power, in being cooler than steam, and the waste water, after having served its purpose in the cylinders, could be utilized for keeping the rake cool, and for sprinkling the hot coke as it was drawn from the retorts. A hydraulic pressure of about 120 lbs. to the square inch was used; and mains were carried overhead—pendulum branch pipes being suspended every 50 feet, and attached to the cylinders by bayonet joints, which allowed the machine to travel and be worked for a distance of 25 feet each way. Mr. Somerville's plan of dividing the machines for charging and drawing was followed in this case; and the two operations were separated. Mr. Foulis originally employed ponies to bring the loaded scoops to the machine; but in 1883, in conjunction with Mr. Woodward, he patented an arrangement by which the coal was brought in long scoops by wire ropes, and automatically tipped into a long hopper fixed above the charging-scoops. An ingenious arrangement was also included in the specification, for directing the coal into the latter at any desired level. The new machine was very simple in its mechanical details; and it could be moved along the retort-house floor by manual power, which could be actuated by the man while on the platform. The author had been informed that this machine could be fitted up complete for £200, exclusive of pipes and pumps; and Mr. Foulis computed that the cost of the drawing and charging operations by hydraulic power at from 8d. to 9d. per ton of coal carbonized. In 1877, Mr. T. F. Rowland, of Greenpoint, U.S.A., invented and patented in England a mechanical stoker. In this case a hopper was fixed on the machine, with a rotary valve underneath; the tube of the valve being of convenient size to hold the quantity of coal necessary for one charge. It thus became a measurer of the coal, which passed by a telescope shoot to the scoop.

In the paper before mentioned, Mr. Hartley described West's

[1] See JOURNAL, Vol. XXXI., p. 955.

manual machine with the patent scoop he first designed; but in 1878, Mr. West patented a charger which opened in the middle.[2] This scoop he had since fitted to all his machines, at the same time so adapting them that any system of power might be employed—steam, compressed air[3], wire ropes, or manual labour. Mr. West had since designed a long scoop for use with his wire-rope system, which completed the charge in one operation, the entire weight of which was carried by the machine. There was no doubt that Mr. West had done very much for mechanical stoking. No man had so continually and so successfully insisted upon its usefulness; and no machines were more generally employed than his. Over 200 of them were now in use at different gas-works in England. In 1886, Mr. West patented his arrangement for the adaptation of power driving by steam generated in the machine,[4] and in 1888 he patented his wire-rope system.[5] The latest pattern Mr. West had designed was one in which an elevator was fixed upon the machine. This consisted of a bucket elevator worked from the main driving gear of the machine, so arranged as to pick up the coal from the floor of the retort-house, and deposit it in the hopper above the scoop from which it was filled; but in other respects the machine was the same as the 1888 form. Longsdon's patent of 1878 (6) consisted of a scoop or trough, which was brought opposite to and touching the mouthpiece. This was filled with coal, and it contained a frame with hinged leaves made to open on withdrawal, but which hung vertical when travelling forward into the retort, and so carried the coal with them. When far enough in, the frame with the leaves was raised and then withdrawn—the leaves hanging back and passing over the coal, which was thus laid evenly on the floor of the retort. It appeared to the author that this invention should work well with new retorts; but when they had become uneven with use, the power required to force the frame in would be very great. The rake of the discharging-machine in this invention differed from all others in that it had blades, at intervals along the rod, consisting of five pieces, free to turn upon the rod and open and shut like a fan. When the rod was sent into the retort, the fans were closed; the rod was then turned, the fans opened, was forced into the coke, and was then withdrawn. These fans, in the author's opinion, would be very liable to stick and refuse to open after being subjected to the high heats that were now used in carbonizing.

The machine next described was that patented by Mr. Warner in 1875, and the simplification of it patented in 1878.[7] The arrangement of the floor of the retort-house required for this apparatus was peculiar, and would preclude its ready adaptation in many works. The author believed it was still working at South Shields, of which place Mr. Warner is the Engineer. The stoker previously mentioned as invented by Mr. Ross, of Cincinnati, was patented in December, 1878, and consisted of a device for forcing the charges of coal into the retorts by compressed air, steam, or gases.[8] In 1879 further improvements were made in this machine; and, in the improved form, it was adopted at Nine Elms, and tried at Marseilles (for patent purposes), and also at Birmingham. The simplicity of this apparatus was its principal feature—there being but few working parts to wear out; but the author was informed that the coal did not on all occasions reach the back of the retort. Four of these machines were fitted up at Birmingham before 1885; and were, the author understood, still in use there and working satisfactorily. About the middle of 1879, Longsdon brought out an improved rake, the back end of which was fixed to a carriage, which ran on a rail set in the direction of the longitudinal axis of the retorts. This was a somewhat elaborate arrangement, and would require harder work than the ordinary rake. In 1883, Mr. Grice obtained provisional protection for an arrangement by which the scoops were fixed on an endless band, which was run into the retort.[9] The scoops being rapidly withdrawn, caused the coal, by its *vis inertiæ*, to remain in the retort. This arrangement was improved upon in Mr. Grice's patent of 1884.[10] There was no doubt this apparatus could be made to work, but the retorts would have to be of very deep section.

A decidedly novel idea, remarked the author, was that of Mr. T. Jefferiss' patent of 1885.[11] He arranged three shoots, for simultaneously charging three retorts. The shoots were pivotted in the centre, so that they could be inclined at an angle of 40°; the lower ends were then closed, and the shoots about half filled with coal. They were next brought to a horizontal position, and opposite to the retorts to be charged; the rear ends were then closed, and the front opened. Into the rear end, a mixture of gas and air was passed and ignited, then an explosion took place, and the coal was shot out and into the retorts in an even layer. The author had not been able to learn that this device was in use at any works. In describing the manual power machinery of Mr. J. Atterton,[12] which was designed principally for use in small works, and which he said could be supplied for about £10, the author observed that it seemed to him that, if by the addition of a roller to an ordinary mouthpiece, one stoker could drive and turn a scoop containing 3 cwt. of coal, this part of Mr. Atterton's apparatus might with advantage be introduced into all works where ordinary hand scoop charging was in vogue, as it must decidedly lessen the labour. In 1887, Mr. Lentz, of Vienna, patented an invention, which the author was informed was working very satisfactorily in that city.[13] It consisted of a long bend, with a funnel at the upper end, to facilitate the insertion of the coal; and, by the force of gravity, it passed down the bend, and deposited itself with perfect evenness throughout a 10-feet retort. Some time back the same idea occurred to the author, and not, then being aware that Mr. Lentz had already patented it, he carried out, by the kindness of Mr. Carpenter, some experiments; and he was bound to say that he found the friction on the sides of the pipes was so great as to stop all the impetus due to the force of gravity.

The paper next included references to Mr. M'Dougall's patent of 1888 for a continuous system of carbonizing [14] (which, the author parenthetically remarked, bore a striking resemblance to Brunton's invention of exactly 50 years before); to the hand-charging apparatus designed by James Cunningham in 1888;[15] to the arrangement patented by Mr. Runge in 1889;[16] and to the invention of Messrs. Somerville and Cutler, introduced in 1889.[17] In the last-named year, Mr. Ruscoe, of Hyde, also patented an ingenious arrangement,[18] a modification of which was being used for the purpose of withdrawing the division-plate in Mr. Trewby's system of charging inclined retorts. The apparatus devised by Mr. C. Eitle, in 1890, next received attention;[19] and then the author mentioned that Mr. Freeman, of the Wandsworth Gas-Works, had a manual machine which was exceedingly simple, and which did away with a great deal of the hand labour of stokers. It had also another advantage in that it could be fitted up in any retort-house where there was sufficient space to work the ordinary hand scoop. An arrangement was now being designed for adapting steam to work this machine. The latest additions to the list of stoking-machines were Mr. Woodhouse's charger and rake, both of which contained some novel features.[20] A new idea of a drawing machine—patented by Messrs. Keetman and Bach, of Germany—was to insert a scoop (made of steel of the same section as, only slightly smaller than, the retort, with the front edge sharpened) under the caked coke, and remove the whole bodily.[21] It was claimed that, by this means, the retorts lasted longer; and the coke was obtained in larger pieces.

Mr. O'Connor said he did not think it would be right in this paper to omit a notice of the various machines invented for charging sloping retorts. The question of the superiority of sloping over horizontal retorts was not for him to consider, so he would simply content himself with recording the different systems adopted for placing the coal evenly in the retorts. He first described M. Coze's original arrangement of settings, and also the mode of charging them.[22] To charge the retort, the lid was opened, and a truck containing three balanced scoops was brought opposite the mouthpiece, and the scoop tilted so as to cause the coal to slide down into a bent-up pipe, and finally form a layer in the retort. The trucks weighed about 16½ cwt. when empty, and held about 9½ cwt. of coal. Then came Messrs. Morris and Van Vestraut's modification of M. Coze's setting,[23] by which vertical doors were used at both ends of the retorts, and the trucks, which were made to suit the method of coal supply—whether from barges, the coal-store, or trucks—were then hoisted above the level of the hydraulic main (which in this arrangement was at the upper end), and run on rails fixed parallel to the front of the beds into position over the shoot. The truck was divided by partitions into two or three charges, as convenient; and the coal passed through a light moveable telescopic adjustable shoot, which could be varied to suit every class of coal from slack to broken cannel. An improved scoop was patented in 1890 by Mr. Van Vestraut.[24] In 1889 Mr. G. C. Trewby, the Chief Engineer of The Gaslight and Coke Company, patented an invention for charging sloping retorts, the main object of which was to spread the coal evenly in the retorts by means of a moveable steel division-plate, which was inserted in the retort prior to charging.[25] This method permitted of the retorts being set at a greater angle than that originally suggested by M. Coze—viz., 38°—thus securing the more easy discharge of the coke. A modification of M. Coze's system had also been introduced by Mr. J. F. Braidwood, of the Greenwich Gas-Works.[26] He set the retorts at an angle of 36°, instead of 29½°; and thus obtained, in the same way as Mr. Trewby, an easy discharge of the burnt-off coke. Brief reference was next made by the author to the chargers for inclined retorts invented by Mr. C. Hunt,[27] and Mr. Henry Woodall;[28] and he concluded his list by alluding to the one devised by Mr. W. B. Lampard.[29]

In bringing his paper to a close, Mr. O'Connor said: There is no doubt a tendency at this end of the century to improve the minds of the labouring classes; and this spread of education is causing a scarcity of workmen who are content to be mere "hewers of wood and drawers of water." As the mind improves, the objection to purely manual labour increases; and more men are desirous of undertaking, and are more capable

[2] See JOURNAL, Vol. XXXIV., p. 479. [3] Vol. XXXVIII., p. 689.
[4] Vol. XLVIII., p. 1153. [5] Vol. LII., pp. 21, 68. [6] Vol. XXXIV., p. 787.
[7] Vol. XXVIII., p. 427; Vol. XXXIII., p. 92; Vol. XXXIV., p. 788.
[8] Vol. XXXVI., p. 855; Vol. XXXVII., p. 969. [9] Vol. XLIII., p. 828.
[10] Vol. XLVI., p. 43. [11] Vol. XLVI., p. 1063. [12] Vol. LI., p. 68.
[13] See JOURNAL, Vol. XLIX., p. 993. [14] Vol. LIII., p. 293.
[15] Vol. LIV., p. 302. [16] Vol. LIV., p. 409. [17] Vol. LVI., p. 552.
[18] Vol. LVII., pp. 22, 1188. [19] Vol. LVII., p. 647. [20] Vol. LVII., p. 554.
[21] *Ante*, p. 168. [22] Vol. XLVII., p. 25; Vol. LV., p. 152; *Ante*, p. 579.
[23] Vol. LV., p. 339. [24] Vol. LVII., p. 647. [25] Vol. LVI., p. 251.
[26] *Ante*, p. 579. [27] Vol. LVII., p. 552. [28] Vol. LVII., p. 1128. [29] *Ante*, p. 353

of understanding, the somewhat elaborate machinery that is being designed for carrying out the processes of manufacture necessary for our every-day requirements.

Discussion.

The PRESIDENT said the members were all indebted to Mr. O'Connor for bringing this paper before them. From his own observations, he thought the engineers who had been engaged in bringing out the various stoking-machines had had a great many difficulties to contend with. Heat, he should presume, had been a most troublesome thing to work against. The tendency at first seemed to have been to make the machines too complicated; but there appeared to have been a departure from this in the direction of making them of a more simple character. With regard to the charging of retorts by gravity, he should be inclined to think that the success of such a mode would depend very much upon the homogeneity of the coal; and if the coal were to vary much, he should judge that the discharge of the shoot would vary also. He was sure the members would join with him in giving Mr. O'Connor a very hearty vote of thanks for his paper.

Mr. PERRY F. NURSEY said that about eighteen months ago, he was instructed to examine and report upon the merits of the Morris and Van Vestraut system of charging and discharging gas-retorts by gravitation. He confessed that it was a most unorthodox proceeding to ask a man who was not a gas engineer to report upon a portion of gas plant. However, he reported favourably; and he believed the invention had since justified his report. The system embodied a principle which appeared to have been first propounded by Clegg in 1804—viz., that of setting the retort at an angle with the horizon, and of charging it at the top and discharging it at the bottom by the action of gravitation. This principle had been followed by subsequent inventors, whose inventions had, in the main, been found defective in respect of that most important point—the means of charging. It would seem that M. Coze was the first to apply the principle in practice with success; but his charging arrangements were comparatively complex and somewhat cumbersome, and, together with his retorts, did not lend themselves successfully to English gas-making practice. Nevertheless every credit should be given to M. Coze for having succeeded in practically applying the principle of gravitation. The question was then taken up (where M. Coze left it) by Messrs. Morris and Van Vestraut, who endeavoured to adopt Coze's system to their own practice at the Brentford Gas Company's works at Southall. This, however, they at length found to be impossible; but they ultimately succeeded in overcoming the obstacles which lay in the way, and in adapting the principle of gravitation to English gas-making practice. Having described the system by a diagram, Mr. Nursey stated that he had witnessed the working of an experimental retort at the Southall works, the results of which were in every way successful. In concluding his remarks, he observed that the success obtained at Southall had led to the adoption of the Morris and Van Vestraut system by seven of the Metropolitan and Suburban Gas Companies, by eleven provincial companies, and by one company in the Colonies; while twelve other companies were arranging for its adoption.

Mr. C. GANDON, the Engineer of the Crystal Palace District Gas-Works, said that he had only had experience with West's system of charging and drawing retorts; and he could speak very much in its favour, although he hoped its inventor would be able to improve upon it still more. He remembered many years ago seeing, at the Maidstone Gas-Works, the first manual charger Mr. West brought out. He was very much struck with the simplicity of it; and to his mind—and the author of the paper had laid stress upon this also—it was most essential that the machines for use in retort-houses should be as simple as possible, because of the liability of any machinery to get out of order where there was coal dust and steam. He believed Mr. West's manual stoker was one of the most simple things he had ever seen; and he believed it was working with success wherever it had been applied. As Mr. O'Conner had pointed out, Mr. Foulis was the first to introduce machine stoking into retort-houses; but he did not think his stoker had been very largely adopted. He remembered seeing it at Manchester; and it had perhaps the drawback that there was too much machinery about it. However Mr. Foulis had considerably modified it; and he had been given to understand that it was working very successfully at Manchester and Glasgow. Of course, the great point with stoking machinery was that, while it produced economy, it enabled gas managers to do with less labour than by hand charging. So far as skilled labour was concerned, he was bound to confess that machinery required more than the ordinary method of stoking. As to Mr. West's compressed-air machinery, he had had it at work for the last three years. When he commenced, it worked very unsatisfactorily; the second year, it worked considerably better; and last winter, they had very little to complain of. He could not say that he had been able to realize the economy that some other managers who had worked the same machinery professed to do. But while there had been a small economy, probably they would gain more in the future, because at present they were obliged to draw the coke out of the retorts on to the floor of the house where the machines were; and this impeded their working. They were now trying to get the coke out of the way; and he believed they would then obtain better results. Since they had had the machines at his works, Mr. West had introduced other improvements, by which he actuated them with wire and cotton ropes. He (Mr. Gandon) had not had any experience with machines worked on this principle; but it seemed to be an improvement. Mr. O'Connor had advocated putting up machinery for working throughout the year. He could scarcely agree with him on this point, because all machinery required repairing; and he considered it was a good plan to have sufficient machinery to work throughout the winter, and to stop in the summer and do any necessary repairing ready for the following winter. The worst part of these machines was that, the more complicated they were, the more liable they were to break down; and they always seemed to do this in the middle of the night, or just at the time they did not want them to. He did not think, taking everything into consideration, that gas-works should be entirely dependent upon machine-stokers; and he thought it was well they should have hand labour to fall back upon if anything should go wrong with them. As to Ross's machine, he did not like it, because is was very ponderous, and it required steam at very high pressure to work it. Then with regard to Mr. Braidwood's invention, it appeared to be a good thing; but he should like to know whether it was not a disadvantage that the gas had to be drawn from the bottom end of the retort, instead of the upper end—it seemed to him that there would be some difficulty in making it travel down. One thing which occurred to him in connection with inclined retorts was this—that whatever angle was adopted when the retorts were perfectly new and smooth in the interior, would not be applicable when they obtained deposits of carbon upon them which interfered with the regular surface of the retort—in other words, if one angle would do when the retorts were new, a different one would be required, when they were old. Whether the tilting machinery would overcome this, he was unable to say. If they could get a perfect system of inclined retorts, it ought to do something towards reducing the cost of carbonization. The most satisfactory system was perhaps Mr. Trewby's, where he had a division-plate, by which he was able to give a steeper incline to the retort; and this favoured the discharge of the coke. He (Mr. Gandon) was only expressing this as an opinion; and he would leave others to decide whether or not it was the most satisfactory system.

Mr. W. A. VALON, the Engineer of the Ramsgate Gas-Works, said he thought that some system of charging and discharging retorts which was not dependent upon hand labour entirely should be used by every gas manager throughout the kingdom. Some twelve years ago, he introduced in his works at Ramsgate, and in one or two other works of which he was Engineer, the simple arrangement produced by Mr. West, which he called his manual machines. These had been at work ever since; and he (Mr. Valon) could only give his testimony to the effect that they had worked very well, they had nothing to complain of, and they had relied upon them for the whole of that period. It was true that perhaps on one or two days out of the twelve months, they had had to stand still for the purpose of making necessary repairs to the machines; but, beyond that, they had not had a breakdown of any account. Therefore they practically worked the machines all the year round; only having recourse to ordinary scoop work for a day or two during repairs. There was no doubt whatever about the saving effected by the machines. He had occasion recently to ask their Accountant at Ramsgate to get out the saving per ton of coal by the hand machines during the past ten years; and it averaged from 1s. 1d. to 1s. 3d. per ton. The wages at Ramsgate were perhaps not so high as in London; and therefore they ought to show a larger amount in favour of machinery. He had had the opportunity of seeing Mr. West's machines worked by wire ropes and compressed air. They were very beautiful arrangements indeed; and they did Mr. West a great deal of credit so far as mechanical skill was concerned. But he must say that he would not have any of his works fitted up with them; and he should not think of doing away with the simple manual machine. He should not have said anything with regard to the subject of inclined retorts, if Mr. Nursey had not introduced it. He did not agree with him at all. Some 20 years ago, he (Mr. Valon) made experiments with sloping retorts at Sheerness, in conjunction with Mr. Carpenter. They were a failure there, for reasons which he did not think had yet been surmounted. He thought one speaker had said that the success or non-success of the system depended a great deal upon the character of the coal with which they had to deal. With dry coal or cannel, he could understand that sloping retorts might be a comparative success; but with soft, caking coal, he had yet to find they had been successful. The slightest impediment of any kind in the retort was a very great nuisance, and led to considerable trouble; and, further, he had not found any section of retort that would take so much coal in a perpendicular or sloping position as it would horizontally, nor did he think that they could be worked so cheaply as the latter could by the aid of a simple manual machine. It looked very well upon paper. He himself was very much fascinated with the system when he first saw it; and he spent a considerable amount of time and money in endeavouring to make it a success, but he had seen nothing since to alter his opinion. He did not think the system was a step in the right direction so far as the carbonization of coal was concerned. It took up a great deal of space; and the heat was very considerable. They all knew that heat ascended; and therefore it must be worse for

the men to work on the top of the beds of retorts than at the sides. Then, again, sloping retorts were introduced to do away with machinery; but it appeared to him that this was only the beginning of machinery, and more machinery was wanted for sloping than for horizontal retorts. There was one other point he wished to refer to. Mr. Nursey said that the inclined system had been applied to fourteen works. He should like this qualified a little, by saying that it had been applied *experimentally* at fourteen works. To say that it would be retained by those works was rather premature. He (Mr. Valon) knew of some works where they would be very glad to get rid of their sloping retorts; and it remained to be seen whether further experience would confirm their use or abolish them.

Mr. Nursey asked to be allowed to say, with regard to the number of works at which inclined retorts had been erected, that he was unable to qualify, from personal knowledge, the statement he had made, as he only received the information on the previous Saturday. As to the question of cost, when he inspected the system, he saw a trial made with a bench of ordinary through retorts, with three men at both ends; and the drawing occupied 4½ minutes per retort, and the charging 50 seconds, with 6 cwt. of coal. With the gravitation system, they had to have only one man at each end; and the drawing occupied 1¼ minutes, and the charging 15 seconds, with 6 cwt. of coal.

Mr. Valon observed that the time occupied in discharging the ordinary retorts was very excessive; it should only have been 1¼ instead of 4½ minutes.

Mr. Van Vestraut said he was very glad to have had the opportunity of hearing Mr. O'Connor's paper read, as it dealt with a subject in which he (the speaker) had taken a great deal of interest. He was sorry to notice that the author had failed to mention Mr. Kitt's invention in sloping retorts, which had worked as successfully as any he had seen. The secret of the success of inclined retorts consisted especially in the burning off of the charges. If the heat was not sufficient to burn off the charges so that the coke was thoroughly dry, then there was as much difficulty in drawing one of these retorts as in the ordinary system; and the difference of time which had been mentioned with regard to the drawing, was accounted for simply by the defective heats which occurred at the time. At some works they complained that, with the inclined retorts, the charges came out too soon; and he himself had seen at one works the charge fall out on to the floor immediately the door was opened. But there the heats were very high. Then, on the other hand, he knew of one or two works where the heats had been defective from the beginning, and the retorts had never worked properly. With these sloping retorts, it was a question of heating as much as anything; and where the heats were good, they showed a great advantage over the ordinary retorts. But the principal difficulty they had was connected with the shoot. With all shoots the difficulty of working them in the retorts was owing to the varying size of the latter. When they became coated with dirt, the scoops got jammed; and therefore, in actual working, it was necessary to have the retorts made larger, so as to give the scoop a little play. With regard to stoking machinery, one great difficulty had been to keep it properly lubricated, on account of the great heat and the dust; but Mr. West had overcome the various difficulties in a very remarkable manner. His plant, however, was rather expensive; but still it enabled gas managers to do away with the stoker, or, rather, he should say, to be independent of him. As Mr. Nursey had said, since 1804, sloping retorts had been tried over and over again. Mr. Wilson and others had endeavoured to work retorts by gravitation; but they had all failed in keeping an even layer of coal on the floor of the retort. If it was possible to have a retort evenly charged, then they would do away with all difficulty. This was what M. Coze found out, and what gas engineers ought to have discovered long ago. They now knew how it could be done; and the only thing was to know which of the different forms of shoot to adopt for charging the retorts. The principle underlying Coze retorts was the fixing of them at the angle of repose; and the inventor had proved that it was perfectly possible to charge them evenly with various classes of coal—slack, lumps, or fine coal. As to machinery with sloping retorts, he did not see that there was any. The coal must be delivered; and it was just as well to deliver it at a high level, so as to get the gravitation. As to cost, with the Coze design, it was quite double that of the ordinary setting; but with the simple through retorts, the price came down to the same figure as for the English setting. With regard to economy, this varied according to the rate of wages paid. In one case he might mention, two men worked 42 retorts. They were working twelve hours per day, for which they were paid 4s. 6d. This was simply for drawing and charging the retorts; and it came out to about 5d. per ton. These wages, of course, were very low; and in London the work would not be done at that figure. On an average, however, the saving would be about 60 to 70 per cent. on the ordinary price of stoking.

Mr. J. Tysoe, Engineer of the East Greenwich Gas-Works, remarked that Mr. O'Connor stated in his paper that the cost of drawing by machinery and charging by hand in the ordinary manner, cost 10d. per ton; while the cost of charging and drawing by machinery was 8d. or 9d. Taking the lower figure, this was a saving of only 2d. by using charging machinery. This, he thought, required a little explanation, though perhaps he did not quite catch the true meaning of what the author wished to convey. It seemed to him, however, that the charging machinery must result in a much larger saving than this. His experience had been gathered from Mr. West's latest improvement—the wire-rope system, which was now in use at the works under his (Mr. Tysoe's) charge. It had been in operation now for about seven months; and the economy which had resulted had certainly been very great. He might say that it worked on a section of 150 retorts; and the saving, he had proved by actual results, had been equal to 11d. per ton. This figure could be depended upon; so that the machinery should be introduced by every manager. They had now only 14 men to do the work, in place of 30 previously. On their first introduction, they had the boilers and engines on the machines. This gave considerable trouble; and they very soon wanted to get rid of them. But when the change was made to the wire-rope system, they soon found the benefit of them. The cost of wear and tear was very low, and not so much as it was generally supposed to be—in fact, it was only a little in excess of the cost of the ordinary mode of charging.

Mr. W. J. Warner, the Engineer of the South Shields Gas-Works, said there were one or two points he might refer to. Some fourteen years ago, machinery driven by endless cotton ropes was introduced at his works; and it had continued to work ever since, night and day. They had no breakdowns, but what could be remedied at once; and the machine went on without any interruption. He had been quite surprised to hear four to five minutes given as the time for drawing and charging retorts. In his retort-house, they went along regularly at one minute for each draw and charge. With reference to the cost of doing the work by machinery, he did not think it had been put forward in a business-like way. In making comparisons, they should give full particulars—such as the name of the district in which the works were situated, the average cost of production per 1000 cubic feet or per ton of coal, the profits per ton, the dividends, the selling price of gas, the original cost of the machinery, and the interest on it—so that gas managers might have all the facts clearly before them, and be able to judge of the difference between the cost of the old method of working and the new.

Mr. W. B. Lampard, by the aid of a model, briefly described his invention for charging inclined retorts set at different levels. There were, he pointed out, no delicate parts in the apparatus; and it worked without any friction.

Mr. J. F. Braidwood, Engineer of the Greenwich Gas-Works, said they had been working inclined retorts for about eight months. During that period, he had found a little overheating of the retorts; but when the heats were more satisfactory, there would be no more difficulty with the inclined retorts than with horizontal ones—in fact, he should prefer them. Any man could work them after a couple of hours' experience. With regard to the roughness of the interior of the retorts, they could charge them now as well as with perfectly level ones; and they were not specially particular about setting them quite level. He placed his retorts at an angle of 36°, instead of 30°; and he attributed his success partly to this.

Mr. John West (Manchester) said, as most of the members were aware, he had been labouring at this question of stoking machinery for many years. The author of the paper had indicated some of the improvements which gas engineers might make, so as to work the machinery more perfectly. One very important matter was that the retort mouthpieces should not be contracted, because if they were, and the machine (say, through a piece of coke) became jammed in them, a very heavy strain was thrown on it; whereas if the mouthpieces were parallel, and slightly larger than the retort, the coke would come out very rapidly indeed. There was one point in the paper he did not quite understand. Mr. O'Connor seemed to think that there was some disparity with regard to the question of the cost of stoking between him (Mr. West) and other engineers. All he could say was that a short time ago he sent round to various gas-works, asking them to give him the results of their working with stoking machinery; and he obtained returns from several. At Maidstone, machines had been working several years; and the cost there was 1·43d. per 1000 cubic feet of gas, or 1s. 3·75d. per ton. The cost from the carbonizing to the tipping of the coke in the yard was 1s. 5·75d.; and the saving was 1s. 2·75d. At Tunbridge Wells, it was 1s. 0·75d.; at Ramsgate, 1s. 3d.; at Westgate, 1s.; and at Folkestone, 1s. 2d. Reference had been made to the Ross drawing-machine being at work at Birmingham; but they had now several of his (Mr. West's) compressed-air machines at the Saltley station, and he had received orders for four more. This showed that they were giving much satisfaction. For small and medium sized works, the manual machine was the most suitable; but he did not agree with Mr. Valon that it was preferable for use in extensive works. He thought that, where they had a large number of retorts to operate upon, there would be considerable advantage in using the power machines. Stoking-machines were handled and worked much more perfectly in some works than in others; and where they were worked properly, they saved more by their use. Something had been said about breakdowns. He thought a machine that worked night and day, and Sundays besides, should be expected to break down sometimes. Of course, they required a little looking after. In Mr. Valon's case they went on year after year; and only on two or three occasions had they required any attention. At Manchester, where he was at one time Chief Engineer, they used machinery, and had been

making, in one works, 8 million cubic feet per diem. They never troubled about the machines there, and never had any serious breakdowns. He was glad Mr. Tysoe was able to give such a favourable report as to the machinery at East Greenwich. He stated that they were working 150 retorts; but he should have said through retorts, or 300 mouthpieces. Mr. Van Vestraut had intimated that machinery was expensive; but he (Mr. West) was sure he could fit up a large retort-house with his machinery upon the horizontal system at considerably less than it could be done upon the inclined system. Before concluding, Mr. West mentioned that his son had been over at Melbourne erecting machines similar to those in use at East Greenwich; and there they were producing an average of 8000 cubic feet of gas per mouthpiece, with a saving of 2s. 2d. per ton of coal carbonized. At the Sydney Gas-Works, Mr. Bush, the Engineer, informed him, they were saving no less than 3s. 6d. per ton; and the machinery there was not put up by skilled men.

Mr. WARNER: What is the size of the retort making 8000 cubic feet?

Mr. WEST: 21 in. by 15 in., and 10 feet long. The coal used yields about 10,000 cubic feet per ton.

Mr. O'CONNOR, in replying upon the discussion, thanked the members for the kind manner in which they had received his paper. Mr. Gandon, he said, had remarked upon the fact that machinery might break down, and therefore it would not do to rely upon it entirely. What he contended was, that machinery for use in retort-houses, should be of such a simple character that it would not break down, and that it should require very little repairing. The less complicated the machinery, the more likely would success come to it. As to Mr. Van Vestraut's observation that he had not mentioned Mr. Kitt's system of inclined retorts, he might point out that the paper did not deal with the arrangement of the retorts, but with the mechanical means of charging and discharging them. With regard to the cost of drawing and discharging the retorts at Birmingham, he obtained the figures he had given direct from Mr. Hunt. With reference to Mr. West's remarks about the cost of machine stoking, he noticed that several of the speakers at the meeting of The Gas Institute in 1890, were not quite agreed as to the exact saving, and therefore it occurred to him that the cause of this was that they had been working on a different basis; and this led him to suggest it in the paper.

IMPROVEMENTS IN THE MANUFACTURE OF WATER GAS.

A correspondent who has had an opportunity of inspecting the improved plant lately completed by Mr. H. Fourness, of Manchester, for the manufacture of water gas, sends us the following:—

As readers of the JOURNAL are well aware, numerous attempts have of late been made to manufacture a cheap and permanent illuminating gas from the decomposition of steam and the admixture of carbon obtained from oils; but the chief difficulty that has hitherto stood in the way has been the cost of production, owing to the process so far introduced not being adaptable for utilizing oils obtainable at a sufficiently low cost to compete, on a commercial basis, with coal gas manufactured in the ordinary way. In the United States, where suitable oils for admixture in the process of manufacturing water gas are abundant, and are obtainable at low prices, the production of a cheap and permanent water gas has become possible under exceptionally favourable conditions; but the high explosion-point of the oils that can be used on the spot in America prevents their exportation to this country for similar purposes. Some time back, there was briefly noticed in the JOURNAL (Vol. LV., p. 926) a process which had been patented by Mr. H. Fourness, of Manchester, for the manufacture of a permanent illuminating gas by the admixture of oils for carburetting purposes; and since then he has been carrying out numerous experiments with the view of perfecting his original plant. He has now patented several improvements, whereby he claims to have overcome the difficulties which have hitherto stood in the way of manufacturing a permanent illuminating gas by the above-named means, and at a sufficiently low price to be a commercial success. An exhibition plant, capable of producing 25,000 cubic feet of gas per day by the new process, has been erected by Mr. Fourness, and has already been inspected by a number of gentlemen well versed in gas matters; but as the final specifications for the new process are not yet completed, I am necessarily precluded for the present from entering into a detailed description of the plant. I may, however, state that Mr. Fourness claims that, by this plant, he is enabled to use any kind of heavy oils for carburetting the water gas produced in the ordinary manner. I am informed that various tests which have so far been carried out have demonstrated that this gas can be manufactured at a cost of less than 1s. per 1000 cubic feet; while it is of a sufficiently permanent character not to undergo any serious deterioration by storeage for a considerable period, or by passage through long lengths of pipes. It may be added that tests have been made with the gas after it has been in the holder for fourteen days, with the result that, at the end of this interval, it has been found to possess an illuminating power of 23·4 candles. As the gas tested was unpurified, it is considered only reasonable that an additional 2-candle power might be expected from gas that has been properly purified. Another important advantage which is claimed for the Fourness process is that all risk of explosions, such as have occurred in other water-gas producers, is entirely obviated by the fact that a current of air is not blown through the retorts or fixers as is usual in the checker-work system. It is further claimed that any existing coal gas of low candle power when mixed or enriched by the Fourness process, will be raised to a higher standard, and that the process will enable cannel coal to be wholly dispensed with in the manufacture of ordinary gas. The tests which have been so far made with the Fourness gas process have been carried out by Mr. Charles A. Burgherdt, Analytical and Consulting Chemist of the Dalton Laboratory, Manchester. It is proposed to form a Company for the purchase of Mr. Fourness's patents, and for starting an establishment to erect gas-works in various parts of the country.

THE PRESSURE OF GAS IN COAL.

The following article on the above subject appeared in a recent number of our contemporary the *Colliery Engineer*:—

Coal in the bituminous mine seams is always more or less subjected to "bleeding." This is well known to the practical miner. He is constantly observing the sweating of the coal, accompanied by a hissing sound. The sweating undoubtedly is produced by the pressure of the gas stored up in miniature cavities and fissures of the seam. This pressure is a subject of increasing interest; for it has been found in some cases to be nearly equal to that of the steam in the boilers of steamships. Pressures of 200 lbs. and upwards have been found to be common in deep seams newly opened out.

What is interesting about the matter is the co-relationship of the pressure of the gas to that due to a vertical column of water, measured from the seam to the drainage-level of the rocks overlying the seam. To make this clear, let us suppose a seam to be 250 fathoms from the surface, and that the drainage-level is about 50 fathoms therefrom. By these data we may with considerable accuracy calculate the pressure of the gas stored up in the cavities of the seam. Suppose the seam has not been wrought, but has been pierced by a bore-hole. If a long iron tube was inserted in this hole, and made gas-tight—that is to say, made to fit the hole so closely, by some system of packing, that no gas could escape—and a pressure-gauge was screwed on to the upper end of this pipe, and allowed sufficient time for gas to accumulate in the hole, the pressure ultimately observed might first be calculated as follows: The vertical height of the water being 200 fathoms, then $(200 \times 6 \times 62{\cdot}5) \div 144 = 520$ lbs. pressure on the square inch. This calculation might, however, have been made by a simpler process, which we highly recommend. A square inch column of water having a vertical length or rise of 6 feet, weighs nearly 2·6 lbs.; therefore $200 \times 2{\cdot}6 = 520$, equal to a pressure of 520 lbs. on the square inch, as before.

Often, as faults and dislocations, water and gas are met with in unusual quantities. Sometimes, on cutting a fault, gas is given off, generally at the bottom of the seam; and this gas often consists of sulphuretted hydrogen. Water is frequently met with at faults. It generally comes off at the fault at the top of the seam; and after the water has expended itself, it is followed by gas, and also consists of sulphuretted hydrogen. Now, why gas should be found at the bottom of the seam and water at the top, is a matter full of interest. Water is sometimes given off at the bottom of the seam; and when this is the case, the reason requires observation and investigation.

When water comes off at the bottom of the seam, some cavity in the neighbourhood of the fault contains gas at high pressure, but is situated above another cavity filled with water; so that while gas is pressing on the water, water flows from the bottom of the seam, through some vent or parting in the fault. But as water is heavier than gas, if the water and the gas are found in one cavity in the bottom stratum of rock communicating with the fault or fissure, then gas only is given off, and sometimes at a high pressure. But it will be noticed that after a while the gas is all spent off, and the air in the vicinity of the fault resumes its normal condition. The gas is expelled by the operation of Boyle's law. It exists in this bottom cavity at a pressure considerably higher than that of the atmosphere; and if the pressure of the gas in the cavity were three times that of the atmosphere, on that pressure being removed it would expand into three times its original volume, or every cubic foot in the cavity would expand into three cubic feet, two of which would be expelled. When the water is given off at a fault at the top of the seam, we may certainly expect this water to be followed by gas, because, being lighter than water, it is pent up at a high pressure above it; and the high pressure of the gas causes a rapid or violent outflow of water. Now, as the gas cannot sink in the water, being lighter, if the bottom of the cavity communicates with the fault, then no gas will spend off until the water has all been expelled. These facts correspond with everyday experience.

Sale of Shares.—At a public sale of shares at Leeds last Tuesday £200 of stock in the *Newcastle and Gateshead Gas Company* sold at £186 10s. per cent.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Board Scrubbers.

SIR,—In your report of the meeting of the North of England Gas Managers' Association in this week's JOURNAL, there is this sentence, referring to the South Shields Gas-Works: "At these works also board scrubbers which were *afterwards* adopted by Mr. George Livesey were first introduced." The italics are mine. It is thus made to appear that the system of fitting scrubbers with thin boards originated with my friend Mr. Warner, and that all these years I have been accepting the credit of an invention which is not mine. Will you, therefore, allow me to give a quotation from the JOURNAL of Aug. 2, 1870?

At the meeting of the British Association of Gas Managers in that year, I read a paper on scrubbers, giving an account of all the varieties with which I was then acquainted; and amongst them I described, in full detail, the arrangement of thin boards, placed *vertically* on edge, which I fitted in a scrubber at these works in 1866, and which, at the time of reading the paper, had been in successful use four years, and, I may add, is still in use.

In the discussion that took place, Mr. Warner spoke as follows: "Mr. Warner said he endorsed all that Mr. Livesey had written; but he claimed to divide the honours with him in the construction of the kind of scrubber described in the paper. It was about the same time that Mr. Livesey spoke of, that he (Mr. Warner) constructed a large scrubber on a similar principle; but his boards were arranged differently. He found from experience that if, instead of placing them vertically, they were placed obliquely one to another, the water or ammoniacal liquor did a much larger amount of work than otherwise. He produced a model of his arrangement, which he stated he had sent to London twelve months ago. There was no complex arrangement on the top of his scrubber for effecting the distribution; but, by a simple arrangement of troughs, the water flowed down from board to board throughout the whole series. In looking through the tiers of trays, it would be seen that there was quite a shower as of rain; and, if placed at their proper angle, the water trickled down both sides, so that both surfaces of the boards were entirely wetted. By this plan no spreader was required; but it was found that complete distribution of the water or liquor was effected. He had had such a scrubber in use since 1866; and it had worked satisfactorily ever since. The year before last he erected another, which was 16 feet square, and about 18 feet high, with an overflow trough on the top; and he found that a very small quantity of water did a large quantity of work. Both vessels were divided into four compartments."

In the course of my reply, I said: "Mr. Warner's idea of constructing a scrubber had occurred to him; but he gave it up for this reason, that he thought *the gas would strike on the under surfaces of the boards, whereas the greater portion of the water would run down on the upper surfaces.* This, however, appeared to be only a theoretical objection, as Mr. Warner said his plan answered very well. Mr. Warner spoke of producing a copious shower in the scrubber; the difficulty seemed to be to distribute a small quantity. With a copious shower, there was something more valuable washed out of the gas than ammonia."

By this it appears that Mr. Warner invented a system of "tiers of trays"—each tray being, if I remember rightly, fitted with pieces of board placed *at an angle* something like the sun shutters occasionally seen outside the windows of houses; while my invention was the system of thin boards placed *on edge vertically*, which has been so extensively adopted, and for which the only reward I have received, or wished to receive, has been the credit of the invention, which was given freely to any who chose to adopt it after I had proved its value.

South Metropolitan Gas Company, GEORGE LIVESEY.
709A, Old Kent Road, S.E., Oct. 10, 1891.

The Sutton Coldfield Town Council and the Gas-Works.—The Gas Committee of the Sutton Coldfield Town Council have instructed their Parliamentary Agent to give the necessary preliminary notice to enable the Council to apply for a Provisional Order, to empower them to acquire the Sutton Gas-Works, if on further consideration it is deemed advisable to do so. They have obtained a report from a surveyor as to the desirability of acquiring the undertaking, and the probable cost to the Corporation.

The Quality of the Ilkeston Water Supply.—At the meeting of the Ilkeston Town Council last Tuesday, a letter was read from the Local Government Board having reference to complaints of insufficiency and unwholesomeness of the water supply. The Board stated that they could not satisfy themselves that the complaints were without foundation, nor could they form an opinion, from the data before them, as to the fitness of the Nutbrook for public supply; and, under the circumstances, they could "only warn the Town Council of the serious responsibility that must attach to them if the continued use of sources of water supply which were not free from suspicion should result in danger to the health of the inhabitants of the borough through the unwholesomeness of the supply." There was no discussion on the letter.

The Blackpool Corporation and the St. Anne's Gas-Works.—At a meeting of the Blackpool Town Council last Tuesday, on the consideration of the Gas Committee's minutes recommending the inclusion in the proposed Improvement Bill of a clause to purchase compulsorily the interest of the St. Anne's Gas Company in the supply by them of gas within the borough, Mr. Buckley moved to refer the matter back to the Committee. He thought if they clogged the Bill with so much matter, it would probably be injurious to it. They should have gone to the St. Anne's Gas Company and have come to terms with them. Mr. Bonny supported the minutes, and said the residents in the district where the St. Anne's Company supplied gas were charged 4s. 6d. per 1000 cubic feet; while in the borough the price was only 2s. 6d. The Mayor also supported the minutes, which were confirmed.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Friday, at the Cannon Street Hotel—Mr. J. BLACKET GILL in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice calling the meeting; and it was agreed to take as read the Directors' report and the statement of accounts, to which reference was made in last week's JOURNAL and elsewhere in to-day's issue.

The CHAIRMAN, in moving the adoption of the report and accounts, apologized for the necessity which had arisen of postponing the meeting for a week. Under their Act, they were compelled to furnish a statement of their accounts to the London County Council, who had adjourned this year somewhat earlier than usual for their vacation; and when the accounts were sent in, it was found that no official authority had been given to anyone to sign them. The Official Auditor declined to pass them until they had been passed by the County Council; and this had caused the delay. In future they would take care to ascertain the date of the departure of the members of the Council for their holidays, so that the accounts might be in before that event happened. The Directors had been sometimes twitted with the meagreness of their report; and it had never been their custom to launch into long disquisitions. They had confined themselves to facts; and he did not think that for many a long day they had had a fact so unsatisfactory and of so startling a character as that they were something like £19,180 short of the dividend which they usually declared. He did not, however, think there was any cause for unnecessary alarm on this account; but at the same time it certainly should give rise to very serious reflection. Of course, at the bottom of it all were coal and labour. In the half year under review, coal had cost £26,816 more than it did in the corresponding period of last year. Wages had also increased by £4647; their lamps, by £194; rates, by £224; and management, by £68. He was glad to say that their bad debts had been less by £159; and the superannuation less by £286. The total of the increased costs, therefore, had been £31,504. To turn to that which was more satisfactory, they found that the gas sold had realized more by £174—that was, an increase of very nearly 9 per cent. Meter-rent had increased by £53; stoves, by £124; coke, by £4203; and tar, by £797. The increased receipts had thus amounted to £14,178, against the additional expenditure of £31,000—leaving a net decrease, as compared with June, 1890, of £17,326. In short, in the past half year it had cost them £149,911 to earn £177,830; whereas in the June half of last year, it cost them £119,000 to earn £163,616. Therefore, if they desired to have the same dividend as they received on the previous occasion, they would have to withdraw £19,183 from undivided profits. They would then carry forward £36,834. He did not propose to trouble the shareholders with any further figures, because they had the whole history of the Company before them in the accounts, which they could peruse at their leisure; but he honestly admitted that it went particularly against the grain to draw from their undivided profits the large sum mentioned. Of course, they could not help bearing this in mind—that if they got rid of their undivided profits, capital must take their place, because that was the capital required to carry on their works. He did not desire to make unpleasant comparisons with other people; but he would like to call the attention of the proprietors to the position of their two neighbours in regard to this question, because he could draw a somewhat reassuring fact from it by doing so. They knew that The Gaslight and Coke Company for a long time past had been making very large "dips" into their reserve fund; and at the present time he did not think that that Company's reserve fund amounted to much more than 2 per cent. of their entire capital. The South Metropolitan Gas Company was very much in the same boat; but, of course, there was a good deal to account for this. They remembered the battle which that Company had fought, and the victory they had won, and upon which they had heartily congratulated them. But this victory, like a great many others, was rather dearly purchased; and the Company felt the effects of it to this day. Both their neighbours had raised the price of gas; and the Commercial Company were at present in the satisfactory position of supplying their portion of the Metropolis at a lower price than either of them. He did not think they must consider their dividend too much; but they must try to bear in mind the real interest of the Company. He had often felt that the very large dividends which gas companies had paid had really not been good; for though it was pleasant, possibly, for shareholders to put the money into their pockets, it had not been in the best interests of gas. It excited the cupidity of local authorities; and a good deal hampered directors' hands in connection with excessive labour claims. The great thing in regard to labour disputes was to have the public sympathy; and he was afraid that public sympathy was not very much exhibited towards gas companies in general. Theirs must not be a selfish policy; they must, to a certain extent, think of the future. It was sometimes said: "Posterity! What has posterity done for us, and what should we do for posterity?" No more selfish remark, however, was ever pronounced. Had they themselves not had a fine property handed down to them, they would not have been in a position to stand the racket of these hard times. He had omitted to mention that their reserve fund would stand, after deducting the large sum from it which he had mentioned, at something like 10 per cent. on their capital—a position contrasting very favourably with the 2 per cent. of the other Companies. It was their duty to try to hand down this trust unimpaired; and he could imagine no way of better stimulating their trade than by cheapness. They might very well meet him on this observation by saying that The Gaslight and Coke Company had increased their trade and price. But, as he had said on previous occasions, that Company worked under very much more satisfactory conditions than the Commercial Gas Company, inasmuch as the district they supplied was such a splendid one in comparison with their own. The shopkeepers in Mile End and Whitechapel very narrowly scanned their gas bills; while consumers in wealthy localities did not, perhaps, even know what they paid. Parliament had given the Company considerable power and it must be their duty to try and

work as amicably as they could, and deal as fairly as possible with their consumers. So long as they had such a reserve fund as he had spoken of, the consumers might naturally feel somewhat aggrieved if they thought it was necessary to raise the price of gas. He desired, however, especially to guard himself against saying that they would not raise the price. Every week they could tell how the business was going on; and if they found it absolutely essential for the best interests of the Company that the price should be increased, they must do it. It would, however, be a matter of the deepest regret to everyone connected with the management of the Company's affairs if this step were taken; and they would strain every nerve to avoid taking it. Knowing as they did that they had great enemies in the electric light and cheap oil, they could well understand that nothing would give more satisfaction to those interests than to be able to declare that the price of gas had gone up. What was it that kept electricity so much in abeyance in London? Simply the cheapness of gas. If they went abroad, they found, even in small towns, electric lighting companies; this circumstance being due to the fact that gas was more expensive there than it was here. The Company, moreover, found—and it was a very satisfactory feature—that their business was constantly increasing week after week; and altogether he should feel very great regret if they had to raise their price. They had sent out something like 265 new stoves in the course of the past six months; and he hoped that, when the working man found what great boons a stove and cheap gas were, he would deal largely with the Company in this direction. He (the Chairman) might say that the consumption of gas during the day was something like 24 per cent. of the total. This showed how much gas was now used as fuel; and he thought it was a particularly satisfactory feature in their accounts. The report stated that certain fines had been imposed upon them for some alleged deficiences in the illuminating power of the gas. This was a matter which always gave their Engineer a great deal of trouble. He believed he had told the shareholders before that they were really compelled to supply gas of a higher illuminating power than that which was ordered by their Act, on account of the variations in the tests. This represented a considerable difference in expenditure to them; and steps were being taken, he believed, by their friends, to see if some modification could be made. It would be a good thing if this effort were successful. The Company had been making experiments with the object of enriching their gas by oil; and he hoped they would succeed, because cannel coal was a somewhat expensive luxury. As to the forfeitures which had been imposed upon them, the Act said that they should come out of the dividend; but for a considerable time they had paid ¼ per cent. less dividend than they were entitled to. As no one would give them credit for anything good, he thought they might take credit to themselves; and so far it was an advantage, as the forfeitures would come out of this ¼ per cent. With regard to the future, one did not like to prophesy without knowing; but he did hope that the worst was past. Of course, they were still working under somewhat dear coal; but the price was much easier than it was when he last addressed the shareholders. Their contracts were made last summer at some reduction. But for two months of the present half year they had been working with dearer coal; and he was afraid that, when they met next time, they would not have a very brilliant balance-sheet to submit to the proprietors. He hoped and believed, however, that they would not have to make such a great inroad into their balance of undivided profits as they had to make on the present occasion. The great misfortune was that though they were paying high prices for coal, they were not really receiving as good a return from coke. In old times, when they paid high figures for coal, they obtained a considerable return from coke; but this article had been going very badly lately, and it made them rather anxious as to the future. There was another great question also before them—the labour question. He supposed that there was no kind of labour, from one end of England to the other, more amply paid than their own men. He did not for one instant grudge the stoker his eight hours, because he thought that, if the stoker worked hard during this time, it was enough for him; but, unfortunately, although the stokers obtained the eight-hour shift, the results were not good all round. Coal did not go so well; and the results were very disappointing to their Engineer. This was the unsatisfactory part of the business. They were even troubled now by the present unfortunate dispute at the wharves. They had a barge of coal lying alongside their wharf, which their men were disinclined to touch, simply because it had been loaded by free men. It seemed to him to be a shocking state of things that working men here, which used to be considered such a free country, could not work if they felt inclined to do so; and he thought that it was the duty of the Government to stand by those who wished to work and do their duty. One great source of the Company's strength was the smallness of the capital employed per ton of coal carbonized; and he considered that they stood in a very advantageous position in this respect compared with the other Metropolitan and Suburban Companies. He thought that, if the worst came to the worst, they would come out better at the end of the current half year than their neighbours. New capital had been issued and allotted; and there was a small balance over, which was to be sold for the benefit of the Company. They had not taken any step in this direction at present; and the proprietors would hear if the Directors decided to put it up to tender. The report also stated that Mr. Fairclough had left them. This gentleman was formerly Chairman of the Ratcliff Company; and he was a Director of the Commercial Company for some time. They had been very sorry to part with him; but his serious illness had rendered this necessary. In the place of Mr. Fairclough, they had elected Mr. J. Giles Pilcher, who was a gentleman of leisure and means, and who had had a good holding in the Company for many years. He trusted that when they next met, they might have a better balance-sheet to present.

The Deputy-Chairman (Mr. Robert Jones) briefly seconded the resolution.

Mr. R. H. Jones suggested that the profit and loss account should in future set out the dividends received on the amount invested in the reserve fund; and, on the other side, the amounts debited to profit and loss for interest on loans, &c.

Mr. Gover urged the Directors to present the accounts showing the figures of the corresponding period of the previous year. The Chairman had spoken of the large dividends paid by gas companies; but he (Mr. Gover) thought that the enormous advantage which had been conferred upon the world by the gas industry ought to be borne in mind. He would like to have seen more progress; and he asked whether it was not possible to bring their gas down to the use of the working man on the small scale seen in the North. If a man could buy gas in small quantities, instead of having to buy oil, he believed that gas would be much more largely used, and that the gas companies would thus be greatly benefited. He urged gas companies to meet electricity. They would profit by the use of gas-engines for the motive power in generating the electric light, and they could put in these engines at a much cheaper rate than electric light companies.

The Chairman, in reply to Mr. Hesketh Jones's remarks, stated that they might probably act upon the suggestion of that gentleman. At all events, they would consider it. As to putting down last year's totals, he believed that this matter was considered some years ago, and it was decided not to do so. The Directors would, however, re-consider the matter. As to supplying gas and stoves to poor men, he thought they were all particularly alive to the fact that they must do all they could to stimulate their trade. They had made very extensive alterations in their works at Stepney, where they had a large showroom; so that everyone who came into the works upon business could see the gas-stoves going, and there was a man there to explain them. He was quite alive to the fact that the poor man did not know what a great advantage a gas-stove was. With the competition of oil and the electric light, they would do all they possibly could to stimulate trade in this direction. The electric light being something new, some people preferred it, and put aside gas; but he thought there was room enough for both. He believed they would see the day when they would have a large trade in supplying gas-engines in connection with the electric light. They would only be too pleased to increase their business in any possible way.

The resolution was then put and carried unanimously; and the dividends recommended were declared—at the rates of 13¾ and 10¾ per cent. per annum respectively upon the old and new stocks of the Company, both less income-tax.

On the motion of Mr. R. H. Jones, a vote of thanks was passed to the Chairman and Directors.

The Chairman, in acknowledging the compliment, expressed a hope that they would be able to show a better result in the future than they had done on the present occasion. He was, perhaps, somewhat pessimistic in certain of his ideas about gas; but he only hoped that some of his prognostications might not be realized. He then proposed a vote of thanks to the Engineer, Sub-Engineers, Secretary, and staff, warmly acknowledging the services which had been rendered to the Company by these gentlemen in the past half year.

Mr. Gover seconded the motion, which was unanimously adopted.

The Engineer (Mr. H. E. Jones), in reply, observed that the Chairman had rightly said that it had not been his (the speaker's) ill-luck since 1869, when he entered the service of part of their present undertaking the old Ratcliff Company or since 1875, when he came to the Commercial Company—in fact, for the whole 28 years that he had been connected with gas companies, it had never been his ill-luck to fail so signally as in the past half year in making both ends meet. In the coal famine of 1872, when coals were dearer than they had been lately, that part of their undertaking formerly called the Ratcliff Company did not raise the price of their gas, and yet they made both ends meet—in fact, they rather overlapped. At that time, however, they were selling gas at a price which did not lie on the lines of production nearly so closely as they had of late years; and this had been at the root of the matter. The Directors had been trying to prove in the last eight or ten years what price gas could be sold at; and in doing so they had reached to high dividends. They had, however, always recommended the proprietors to take ¼ per cent. less than they were entitled to; and for this generosity the gratitude of the public was due to them. He desired to be quite candid with the proprietors; and, apart from the price of coal, the working had not been good in the half year. He would have been very much distressed at this, only that he had found their neighbours' experience had been similar to their own. All through the South of England, the reports of the gas companies had shown the effect not merely of higher prices of labour and materials, but also of the adverse influence of the working results—especially as they had been subjected to exceptional climatic influences. The coal-owners, too, were now so uncertain as to their ability to discharge their contracts, that gas companies had been obliged to take coals when they really did not want them; and these had been subjected to rain and other adverse influences during the time they were stored. With regard to certain of Mr. Gover's remarks, the Commercial Company had reduced the rent of its small-sized meters to about one-third of what was usually charged in the country; and they had also abolished deposits whenever a workman could bring any kind of testimony as to good character. The Company had also undertaken to instal fittings for working men at such a rate as 5s. for the whole thing for a single light, and to give every possible facility to them in avoiding having to meet the first charge on commencing the new light. He was bound to say that they were very slowly and gradually getting a sort of footing with this kind of supply; but he did not think there was any great field for it, and there was no necessity for them to run after the working man. They had not a very wealthy district; but theirs was a class of lighting where economy was of the first importance, and where people found that they could not get anything so good as gas. The working man, under the circumstances mentioned, did practically buy gas from the Company in the cheapest manner. He (Mr. Jones) was no believer, however, in the idea that a man wanted to "put a penny in the slot," and to pull out a certain quantity of gas. With the credit given to working men by the Company, they could very well afford to have their gas from them. As to the electric light, if people wanted that light and to put up gas-engines, the Company would willingly give them every facility; and he was not sure that they would not go the length of hiring to them gas-engines, if they wished the Company to do so. This was now being done by the Dublin and Cork Companies. They had no power to spend a shilling on electric light fittings; and they could not put in such an installation. He would now tell them what had been told

to him two days ago by the leading practical Electrical Engineer in England—he did not mean the gentleman who made fine speeches, and told them what a pound of coal would do. They knew that for every pound of coal they put into their retorts, they got back seven-eighths of a pound of useful and valuable things; whereas in the case of electric lighting companies, the pound of coal gave no residuum. The gentleman to whom he referred, who had very prosperous works near London, and who was doing a very large amount of work, went the length of telling him that he did not at all believe in the extravagant statements which were made by electric lighting people generally about their future. This gentleman thought that as the special light of luxury it would force gas out of a very limited field. So far as the Commercial Gas Company were concerned, they had no "luxurious" field in their district. They were all struggling people—manufacturers and shopkeepers, chiefly for the working classes; and they did not expect to minister to luxury in any form. The great backbone of lighting would remain with gas companies; and, notwithstanding the unfair remarks which were made about bad gas-burners, and so on, the cost was five to one against electricity. Wherever gas was made and sold in London, it was made and sold on a reasonable and progressive footing. He would back Mr. George Livesey and his cheap gas to keep electric lighting in very good order in the South of London.

The SECRETARY also acknowledged the vote; and the proceedings then terminated.

ACCOUNTS OF THE COMMERCIAL GAS COMPANY FOR THE HALF YEAR ENDING JUNE 30, 1891.

No. 4.—REVENUE ACCOUNT.*

To Manufacture of gas—				By Sale of gas—		
Coals, including dues, carriage, unloading, and trimming (see account No. 8)		£87,749 13 7		Common gas, per meter, at 2s. 4d. per 1000 cubic feet	£111,692 10 10	
Salaries of Engineers, Superintendents, and other Officers at works		2,082 0 0		Public lighting and under contracts, common gas. (See statement No. 10.)	9,180 5 7	£120,872 16 5
Wages (carbonizing)		20,126 19 1		Meter-rental	£1,903 13 5	
Purification, including £1878 7s. 7d. for labour		4,705 12 8		Stove-rental	659 13 4	2,563 5 0
Repairs and maintenance of plant and works, materials and labour (less £106 5s. 7d. received for old materials)		14,472 10 0		Residual products—		
Distribution of gas—		£129,136 14 11		Coke, less £3721 14s. 11d. for labour	£33,382 15 0	
Salaries and wages of Officers (including Rental Clerks)	£2,217 17 0			Breeze, less £508 19s. 7d. for labour	684 7 0	
Repairs, maintenance, and renewal of mains, service-pipes, and fittings, including labour	1,927 9 2			Tar	9,975 8 10	
Repairs and renewals of meters and stoves	1,878 0 2			Ammoniacal liquor and sulphate	10,230 2 1	54,272 12 11
		6,023 6 4		Miscellaneous receipts—		
Public lamps—Lighting and repairing		2,329 0 1		Rents	£98 10 6	
Rent, rates, and taxes		5,630 0 7		Transfer fees	23 7 6	121 18 0
Management—						
Directors' allowance	£1,250 0 0					
Company's Auditors	75 0 0					
Salaries of Secretary, Accountant, and Clerks	1,093 8 6					
Collectors' salaries and commission	1,443 3 2					
Stationery and printing	471 5 7					
General charges	674 5 7					
		5,007 2 10				
Bad debts		877 13 2				
Law and Parliamentary charges		168 8 6				
Superannuations		650 8 0				
Official Officers		88 17 0				
		£149,911 11 5				
Balance carried to profit and loss, net revenue account (No. 5)		27,919 1 8				
		£177,830 13 1				£177,830 13 1

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on debenture stock	£2,925 0 0	Balance, Dec. 31, 1890	£100,818 9 5
Balance available for dividend, carried to balance-sheet	81,634 12 1	Less amount of dividend paid for half year ending Dec. 31, 1890; and £1 for feiture for defective power	44,801 0 0
			£56,017 9 5
		Balance from revenue account (No. 4)	27,919 1 8
		Dividends and interest balance	623 1 0
	£84,559 12 1		£84,559 12 1

No. 6.—RESERVE FUND.

Balance on June 30, 1891	£44,379 5 1	Balance on Dec. 31, 1890	£44,379 5 1
	£44,379 5 1		£44,379 5 1

No. 7.—INSURANCE FUND.

Balance on June 30, 1891	£34,000 0 0	Balance on Dec. 31, 1899	£34,000 0 0
	£34,000 0 0		£34,000 0 0

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1890.	Received during the Half Year.	Carbonized during the Half Year.	In Store, June 30, 1891.
	Tons.	Tons.	Tons.	Tons.
Common	27,598	99,774	107,921	19,451
Cannel	1,949	4,287	5,073	1,163
	29,547	104,061	112,994	20,614

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1890.	Made during the Half Year.	Used during the Half Year.	Sold during the Half Year.	In Store, June 30, 1891.
Coke—chaldrons of 36 bushels*	15,140	147,276	43,373	91,815	27,328
Breeze do. do.	1,620	13,251	—	11,205	3,666
Tar—gallons	297,600	1,061,579	—	1,087,579	271,600
Ammon. liq.—butts of 108 gals.	6,404	36,013	34,347	—	8,070
Sulphate of Ammonia—tons	614	1,189	—	1,482	321

* Under "Weights and Measures Act, 1878."

No. 10.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity Made. Meter Register.	Quantity Sold. Public Lights and under Contracts (estimated).	Quantity Sold. Private Lights (per Meter).	Quantity Sold. Total Quantity Sold.	Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lights.
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	1,097,871	57,997	957,364	1,015,361	15,076	1,030,437	67,434	5,293

BALANCE-SHEET.

To Net Revenue—		By Capital—For balance, per account No. 3	£4,280 15 2
For balance, per account No. 5	£81,634 12 1	Cash at Bankers	11,131 7 5
Reserve Fund—		Cash in hand for current expenditure	1,900 0 0
For balance, per account No. 6	44,379 5 1	Amount invested in Consols	78,379 5 1
Insurance Fund—		Stores in hand—	
For balance, per account No. 7	34,000 0 0	Coals	£16,097 0 0
Unclaimed dividends	1,969 17 0	Coke and breeze	8,951 8 6
Deposits	9,219 2 8	Ammoniacal liquor and tar	8,007 3 4
Interest on debenture stock	164 8 2	Sundries	5,625 2 4
Sundry tradesmen and others, for amount due for coals, stores, and sundries	15,909 12 8		38,680 14 2
		Accounts due to the Company—	
		Gas-rental, quarter ending June 30, 1891	£44,786 8 5
		Arrears outstanding	1,204 7 0
			45,990 15 5
		For coke and other residual products	£6,633 8 8
		Sundries	220 11 9
			6,854 0 5
	£187,216 17 8		£187,216 17 8

* Statements Nos. 1 to 3 (the statements of share and loan capital and the capital account) were summarized in the JOURNAL last week (p. 627).

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly General Assembly of the Proprietors in this Company was held last Tuesday, at the Offices, St. Helen's Place, Bishopsgate Street, E.C.—Mr. GEORGE BANBURY in the chair.

The SECRETARY (Mr. I. A. Crookenden) read the notice convening the meeting; and it was agreed to take as read the report of the Directors and the statement of accounts, which were summarized in the JOURNAL last week.

The CHAIRMAN said he greatly regretted the absence of Mr. Gadesden (the Chairman of the Company), who had not yet recovered from a severe attack of influenza; and he was sure they all sincerely hoped that Mr. Gadesden's absence was only temporary, and that he might soon return to them. With regard to the report, he might say that they had had on the whole a satisfactory half year. There had been an increase in revenue of nearly £5000; but this had all been consumed by the high price of coal, by their first payment to the Chamberlain of London under the Act of 1886, and chiefly by the increase in the law charges, owing to the Company having to appear before the Parliamentary Committee on the Water Bills of last session. He would refer to this inquiry later on; but he might say, *en passant*, that, without any fault on their part, they had been subjected to an outlay of about £5000. They must not, however, say that this money had been altogether a bad investment, as the inquiry had been advantageous rather than disadvantageous to them. No charges of any kind were brought against them. Thus it was that the Chairman of the Committee distinctly declared "that nothing has been alleged which calls for any defence on the part of the Water Companies." This was a gratifying statement. The inquiry had also pretty well demolished that fine old fiction, the competing supply. He did not suppose anyone really much believed in a competing supply; but it was a useful sort of bogie to be raised, with a view of frightening them into parting with their property at a price far below its value. In a word, he might say that their position, when they came out of the inquiry, was better than it was when they went in. He thought that they owed much to their leading Counsel (Mr. Pember, Q.C.), who was a tower of strength. He was also more than their able advocate—he was a firm friend; and they had retained his services for the future. Regarding the progress of the works, much had been done during the past half year towards effecting their final departure from Old Ford to Lea Bridge. The three new triple expansion engines at the latter station were now working smoothly and successfully; and doing the duty of those about to be abandoned at Old Ford. They could each pump 12 million gallons of water a day; and the economy in the coal they burnt was something remarkable. They hoped to take a final farewell of Old Ford next November. Although the station had done good work since its "birth" in 1807, it was now out of date; and the concentration of their works would not only facilitate management and supervision, but would, they trusted, save them £4000 a year. With reference to the wells, which must play such a prominent part in their present and future prospects, their Waltham Abbey well continued a great success. They pumped therefrom to High Beech, whence the supply gravitated to Chigwell, &c. But although this area was well served, they had a goodly surplus remaining. They had, as it were, a balance at their bankers to draw upon in time of need. The cylinders in their well at Walthamstow had been firmly fixed in the chalk; and as they sank the shaft, they came apparently upon a good water-bearing stratum, as they now obtained more than a million gallons from that shaft alone, with no adits, so that matters looked promising. At Chingford, their Engineer (Mr. W. B. Bryan) was sinking, with the Company's own workmen, a well 12 feet in diameter. The upper cylinder and the brickwork had been completed to the depth of some 50 feet; and if this turned out favourably, as the borings tended to prove, it would be a most valuable source of supply to their mid-level district. The well at Lea Bridge had been a difficult business, and had caused them much anxiety and at times considerable disappointment. But perseverance and Mr. Bryan's skill had conquered; and they now obtained upwards of 3 million gallons a day of beautiful water. It had, however, taken five years to accomplish this. They had had to drive a mile of adits, and the outlay had been considerable. Whilst on the subject of wells, he might say that a letter had lately appeared in the press by Dr. Chesshire, F.R.C.S., an authority on water supply. He stated that river water mingled with deep well water was the best and most wholesome. This was just what the East London Company were now largely supplying. Dr. Cheshire went on to say that there was ample chalk water available at no great distance from London to mix with the Thames and Lea supply; and in the *Morning Post* of the previous day, an article, after similarly referring to the available future supply from deep wells, concluded thus: "As regards the assumed necessity for abandoning the Thames and Lea as sources of supply, it is enough to say that London has, for the last ten years, been one of the healthiest cities in the world, and has been especially free from those diseases which are ordinarily associated with the consumption of polluted water." Reverting to the Parliamentary Committee, he said that all the Water Bills that were read a second time in the House were referred to the Committee; but only two of them came up finally for inquiry—the Vestries Bill, which proposed that they should be purchased by arbitration, and that of the County Council, which asked for powers to introduce Bills for regulating the present supply, or for the purchase of existing works. After due investigation, the Committee decided that the preambles of these Bills were not proved, and that they would make a special report to the House. He would read to them the four principal points in the report. The first was that powers should be granted to the London County Council "to expend such further sums as might be reasonably necessary, in order that they might examine the whole position of the Metropolitan Water Supply;" the second point was that," if the County Council should so resolve, they should have power to promote a Bill or Bills in Parliament for the purpose of constituting themselves the responsible Water Authority for London, acting through a Statutory Committee;" the third point was "that the County Council, if constituted the Water Authority, should be required to purchase the undertakings of the Water Companies by agreement, or, failing agreement, by arbitration within a fixed period;" and the fourth point was that, "in the event of the undertakings of the Companies not being acquired by purchase, the Committee recommend that there should be a parliamentary inquiry into the statutory powers and obligations of the Companies." When this report was submitted to the House, it was late in the session. No remarks were made thereon, as far as he remembered, by any member of the House. The Chairman of the County Council, however, asked whether the Government would give facilities to pass the Water Supply Bill in the form recommended by the Committee; but the Chancellor of the Exchequer replied that he understood that the Bill would be highly contentious, and that it would be contrary to their pledges to the House to give such facilities. There at present matters stood. Before the inquiry began, Parliament decided "that it be an instruction to the Committee that they have power to inquire into all matters connected with the nature, price, management, sources, and sufficiency of the water supply of London and its suburbs." This naturally opened the doors to an inquiry, the extent and duration of which was impossible to foresee. The Directors had therefore, at great cost, to be ready with a large amount of documentary and oral evidence to prove that they had fulfilled their duties to the public quite as faithfully as any Municipalities in the country, and that they were prepared to furnish additional supplies to meet the future requirements of an increasing population. When Mr. Pember formally tendered this evidence, the Chairman announced "that the Committee do not see the necessity for it at all, and that the Water Companies will not be prejudiced by the Committee declining to hear such evidence." There was nothing for them to fear from further investigation; nothing was brought forward to show that the Water Companies had not satisfactorily performed their gigantic task of supplying 5½ millions of people with 200 million gallons of water daily—a task which the Chairman of the London County Council and the Chairman of the Middlesex County Council both admitted that it might be well to leave with the Companies. Surely, the opinions of such leading men as Sir John Lubbock and Mr. Littler should carry much weight. He could not help thinking that if the public knew more about the matter, they would not be particularly anxious for a transfer. One newspaper recently said: The public are by no means well informed as to the subject of control over the Water Companies." This was indeed the truth. The public seemed to think that the Companies were independent autocrats, who could do pretty much as they liked. Never was there so great a mistake. They were checked at every turn. Their present supply, their future supply, their dividends, their capital, and (most important of all) their charges, were strictly regulated by Act of Parliament. Then there were the Government Auditor, the Government Analyst, and General Scott, of the Royal Engineers, the Water Examiner; and if anyone said the control of these officers was merely a formal, or perfunctory performance, he (the Chairman) could only say he was greatly in error. Mr. Stoneham took three days in personally going through the very accounts now before the meeting; he did not depute the task to any subordinate. General Scott, who supervised the filtration and other works, was formerly with him (the Chairman) in India; and he could safely say he was not a man to let any shortcomings or deficiencies on the Company's part pass unheeded or unrebuked. It must not be supposed that they objected to control—far from it; all they said was, Let it be Government control, and not that of vestries, councils, or municipalities. Finally, if the public thought they would get cheaper water, greater courtesy, or readier redress, from a municipality than from the Companies, they were likely to be much disappointed. Rates had a remarkable tendency to increase, unless restricted by Act of Parliament, as theirs were. Then, the Directors of a Company, and their staff, must naturally be more accessible, and more amenable to public opinion than bodies corporate; and if Directors made mistakes and caused losses, these losses fell upon the shareholders, but in the case of public bodies, such losses fell upon the long-suffering ratepayer, who, as usual, had to grin and bear it. As regarded their own Company's affairs, he could truly say that their Engineer had added to his deservedly high reputation by successfully carrying out the difficult and important task of their transfer to Lea Bridge. Mr. Bryan had their interests—and, he might say, those of the public—so much at heart, that the Directors were at times afraid that he was overtaxing his strength; but they took great care of him, as they fully recognized the pre-eminent value of his services to the Company. The Secretary had lately done them yeoman's service with regard to the rating by the parishes at the last quinquennial assessment. In several instances, they had to object to the new rating as excessive; but, greatly owing to Mr. Crookenden's tact and discretion, the parishes met them fairly enough, and all was settled satisfactorily for the Company without any outlay for surveyors, lawyers, or experts. There was only one other point that he had to mention. Mr. Pember's speech to the Select Committee was such an able and clear statement of the Company's case that they had had it printed; and he wished to draw very particular attention to the end of that speech, where the learned Counsel suggested the whole or partial amalgamation of the Water Companies, under certain control. Mr. Pember pointed out that the difficulties of details might be as satisfactorily overcome as they were in the case of the Gas Companies. He also said that, amongst other advantages, there would be economy of management, the saving of much time and outlay in further inquiries, and that a vast and difficult financial transaction on the part of the community for the purchase of the Companies would be saved. This would be an enormous advantage to everyone, would prevent much expense; and the whole question of their purchase would then be avoided. There would be a great many difficulties of detail; but by the help of actuaries and financiers, and Mr. Pember himself, he thought they could all be overcome. He concluded by moving the adoption of the report, and the payment of a dividend on the ordinary stock at the rate of 8 per cent. per annum, less income-tax.

Mr. H. DALTON seconded the motion.

Mr. F. B. BROWN regretted that so few shareholders had attended the meeting; for he thought the present was a time when the Directors should have the entire support of the shareholders. The Water Companies were frequently attacked in the newspapers; and he would like to know the object of those attacks. It was stated that the Companies

gave an insufficient supply; that the water was not pure; that the charges were exorbitant; and there were various other allegations. He wished to know if any of these accusations were true in regard to the East London Company.

Mr. W. BIRD, referring to the recent case of the *East London Water-Works Company v. Chard* (*ante*, p. 634) inquired whether £50,000 was outstanding in connection with the class of rates referred to in the action, as stated by the Company's Solicitor (Mr. Kebbell).

The CHAIRMAN, in reply, said, with regard to the allegations made against them, he could only say that if they did not give a proper supply, their immediate superiors, the Local Government Board, would soon be "down" upon them. As to the purity of the water, the Government Analyst looked to this; and, with their own Analysts, they recorded the results of their tests with mathematical accuracy. The charges made to consumers, and the mode of collecting them, were, as he said before, strictly regulated by Acts of Parliament. He was not surprised at Mr. Bird's question; for the point referred to must have struck many persons. By Mr. Fulton's Act, they were bound to supply houses not exceeding £20 rateable value without power to cut off for non-payment. Thus it sometimes happened that the tenants paid the water-rates to the landlord, who pocketed them with impunity—a state of things the Judge characterized as "monstrous." As to the £50,000 of arrears, Mr. Kebbell must have meant that the revenue under this head came to that sum. The final arrears, as the accounts showed, amounted, as usual, to about £400 for the half year.

The motion was unanimously agreed to.

Mr. F. TENDRON, in proposing a vote of thanks to the Chairman and Directors, congratulated them on the result of the parliamentary inquiry, and then referred to the letter by Colonel Makins, M.P., which had appeared that day in *The Times*, in which the writer characterized the recital of the report of the Special Committee of the London County Council as a "wail of impotence, because a Parliamentary Committee has not seen fit to sanction a breach of public faith." Colonel Makins had set out in his letter all that the Companies asked—that if it were for the public interest that the undertakings of the Water Companies should be purchased, the least that could be given to them was the income, present and prospective, which they now enjoyed.

The motion was seconded and unanimously adopted; and a vote of thanks to the Engineer, the Secretary, and the staff brought the meeting to a close.

ALTERATIONS AT THE MONTROSE GAS-WORKS.

At a Meeting of the Directors of the Montrose Gas Company held last Wednesday, the Manager (Mr. T. Douglas Hall) read a report in regard to the alterations, improvements, and extensions on which he has for some time been engaged, and which are now completed and working most satisfactorily. In June last year, the purifier connections were altered, by replacing two 8-inch three-way valves by two 10-inch four-way valves, whereby the gas could be made to pass always through the clean purifier last. By this alteration, 28 purifiers less were charged in the year ending June, 1891—causing great saving of labour and purifying material; and the gas sent out was purer than was possible under the old arrangement. In October of the same year, a 10,000 cubic feet per hour Beale exhauster, with 8-inch combined compensator and bye-pass, was fixed in place of an old Whimster washer and exhauster. The new apparatus was made by Messrs. R. Laidlaw and Son, of Glasgow, and has been in use for a twelvemonth. This year several small additions have been made, including a new pump to the scrubber; making three liquor-pumps and one tar-pump now in operation. Two self-acting tar drips have been put in where the pipes were level, and the tar had a tendency to collect; also one for water on the inlet of the station meter. The engine-room and the office have also been repainted and neatly done up. The Works Committee, who had carefully examined all the plant, machinery, &c., expressed themselves highly pleased with all that had been done; reporting that the whole works were in excellent order. At the same meeting it was unanimously resolved that Mr. Hall's salary should be increased by £20, in consideration of his careful management. The Manager's monthly report was also read; showing that during September 159 tons 5 cwt. of coal had been carbonized, from which 1,757,700 cubic feet of gas was manufactured, or at the rate of 11,050 cubic feet per ton; the average illuminating power for the month being 27 candles. Although the price of gas has been raised from 4s. 2d. to 4s. 7d. per 1000 cubic feet, the four months of the year from the 1st of June last showed an increase of 127,000 cubic feet in the consumption; and this in the face of two very large electric light installations. Owing, however, to the Gas Company using coal of first-class quality, the new light has a powerful rival in the gas supplied in the town.

Reduction in Price.—The Directors of the Farnworth and Kearsley Gas Company have reduced the price of gas to small consumers from 4s. 3d. to 3s. 2d. per 1000 cubic feet. The reduction will not affect the mill-owners and large consumers of gas for trade purposes, or the Local Board, who have hitherto been supplied at less than the maximum rate.

Lighting the Council Chamber at Columbus (Ohio) with Gas.—The Council of Columbus have determined to illuminate their Chamber during the coming year with gas; and the contract has been given to the local Gas Company at the regular price. The Company will, it is stated, fix in the Chamber 20 Lungren regenerative lamps, of which a description was given last week (p. 623).

The Coal Discovery near Middlesbrough.—The Newcastle Chemical Company have decided to resume the boring for coal which was recently discovered underlying their salt royalties at Haverton Hill, at a depth of 1956 feet. With this object, a diamond boring apparatus has been substituted for the American drill by which the boring has been carried on hitherto, and already 1800 feet of the tubes for the drill have been placed in position in the bore-hole.

METROPOLIS GAS SUPPLY.

The Quality of the Gas in the Past Quarter.

The following is an abstract of the report of the Chief Gas Examiner for the Metropolis (Dr. A. W. Williamson, F.R.S.) as to the quality of the gas supplied by The Gaslight and Coke, the Commercial, and the South Metropolitan Companies, during the quarter ending the 30th ult.:—

I. *With respect to Illuminating Power.*—The average illuminating power, in standard sperm candles, at each of the testing-stations, was as follows:—

The Gaslight and Coke Company—	
Jewry Street, E.C.	Closed
Cloth Fair, E.C.	16·5
Dorset Buildings, E.C.	16·5
Ladbroke Grove, W.	16·4
Devon's Road, E.	16·5
Carlyle Square, Chelsea, S.W.	16·2
Camden Street, N.W.	16·4
George Street, N.W.	16·2
Graham Road, E.	16·6
Kingsland Road, E.	16·5
Spring Gardens, S.W.	16·5
Grove Gardens, Regent's Park, N.W.	16·3
Hornsey Road, N.	16·8
Lambeth Road, S.E.	16·3
Millbank Street, S.W. (cannel gas)	22·0
Commercial Gas Company—	
Parnell Road, E.	16·6
Wellclose Square, E.	16·4
South Metropolitan Gas Company—	
Hill Street, S.E.	16·4
Foster Place, S.W.	16·5
Stoney Lane, S.E.	16·6
Lewisham Road, S.E.	16·7
Burrage Road, S.E.	16·5
Blackfriars Road, S.E.	16·5

It will be seen from these results that the average illuminating power of the gas at all the testing-stations of the three Gas Companies has been higher than the parliamentary standard, especially at the Millbank Street station. At the Ladbroke Grove, Camden Street, Lambeth Road, Parnell Road, and Bedford Road stations, the lighting power of the gas did not fall below the requirements, even when weakest; and at the Dorset Buildings, Devon's Road, Carlyle Square, Graham Road, Kingsland Road, Grove Gardens, George Street, and Hill Street stations, the minimum illuminating power was equal to the requirements. Certain deficiencies in the lighting power of the gas were returned by the Official Gas Examiners during the quarter at the King Street, Spring Gardens, Hornsey Road, Wellclose Square, Stoney Lane, Lewisham Road, Burrage Road, and Blackfriars Road stations.

II. *As regards Purity.*—Sulphuretted hydrogen was not present in the gas at any of the testing-stations. The average amount of sulphur in other forms than this was considerably below the amount allowed at all the stations. With the exception of an excess at Carlyle Square on the 3rd, 4th, and 6th of July, and at Spring Gardens on the 29th of August, the limit allowed was not exceeded on any occasion during the quarter. Ammonia was generally present in the gas more or less frequently during the quarter at all the testing-stations, but only in slight quantities. No excess was reported on any occasion. The City of London testing-station at Jewry Street has been closed since the 21st of August.

THE ALLEGED ATTEMPT TO BRIBE THE SALFORD GAS ENGINEER.

A True Bill against Mr. Kershaw.

The General Quarter Sessions for the County Borough of Salford opened last Friday; and, in the course of his charge to the Grand Jury, the Recorder (Mr. J. M. Yates) referred to the charge against Mr. Sydney Kershaw of attempting to bribe the Gas Engineer of the Salford Corporation (Mr. S. Y. Shoubridge). Having explained the nature of the offence, and mentioned the statute under which it was made a criminal one, he recapitulated the facts, as set forth at the hearing of the case by the Magistrates on Aug. 21 last (*ante*, p. 357), when the accused was committed for trial. He concluded by informing the Grand Jury that it would be their duty not to try the case, but to determine whether there was such a charge made out against the defendant as would warrant its being sent for trial before a judge and jury. Any defence which the accused might have could, and would, be considered hereafter. He added that if the Grand Jury should bring in a true bill, the case would not be dealt with there, but would be sent to the Central Criminal Court, London, in accordance with an arrangement already agreed upon. After the Grand Jury had deliberated for some time, they were called into Court. The Recorder observed that he understood there was some question about which they wished to speak to him. The Foreman said he thought one or two of his colleagues objected to the indictment as to the motive. The Recorder remarked that it was rather a singular position to be placed in. If there was any question of law he could direct the Jury upon, he would do so with pleasure. A juror said he should like to know if the offence would be the same, supposing any of them considered that money or bribe, whatever it was, offered in an envelope, was tendered for past or for future services. The Recorder did not think it would matter. The Act of Parliament said that if a person either gave or promised, or offered any gift, reward, or advantage whatsoever, whether for that person's benefit or for the benefit of someone else, as an inducement to that person or as a reward for doing or for refraining to do anything in respect of any matter or transaction whatever, actual or proposed—that was, either present or past transactions, either an actual transaction or a proposed transaction—in which a public body

was concerned, he should be indictable. All the Jury had to satisfy themselves of was that there was a *primâ facie* case which called upon the person charged to make a defence. If they were satisfied that, unanswered, the charge made was a good one, then they ought to bring in a true bill. If, on the other hand, they thought that, unanswered, the person ought to be acquitted—that was to say, that there really was no case against him—then they should reject the bill. But they ought not to try the question as to whether the accused was guilty or not guilty. The Grand Jury retired; and a few minutes later returned into Court with an announcement that they found a true bill against Sydney Kershaw for misdemeanour.

THE ELECTRIC LIGHT SCHEME FOR MANCHESTER.

As our readers are aware, the Manchester Corporation are making arrangements for affording a supply of electricity for lighting purposes within a certain district of the city. We learn from a local paper that the general arrangements are in a forward state; and no doubt is entertained that mains will be laid in the compulsory area of supply—bounded by Market and King Streets, the Infirmary, and St. Mary's Church—before August next, the period specified in the Provisional Order under which the Corporation are acting. They may, of course, extend the mains, from time to time, to any portion of the larger area over which they have powers (which embraces the Victoria, London Road, and Central Stations, the Infirmary, and the Town Hall), as sufficient business to justify the outlay comes in. The Committee who have had the matter in hand, have lately had under consideration a number of sites which are regarded as suitable for the generating station, which will also comprise that for supplying hydraulic power; and last Wednesday the City Council were asked to choose between two sites—one the town yard at the end of Dickinson Street, and the other a plot of land in Gloucester Street which has been purchased for £15,900. The former was preferable, in the opinion of Dr. Hopkinson, who has charge of the electric lighting arrangements, and of Mr. Corbet Woodall, who has been entrusted with carrying out those for the hydraulic power scheme. But the other site, which abuts on the Rochdale Canal, commended itself to the Committee. This site was chosen, after some discussion. By thus having the plant for the two schemes concentrated, considerable saving will be effected in labour and in the coal required for the engines, as one set of boilers will serve both purposes. It is, of course, impossible as yet to form an opinion as to the extent of the demand there will be for the electric light; and it has therefore been decided to adopt plant of such a size as will certainly be required, and which can be added to by duplication from time to time as needed. One engine with a large dynamo machine will deliver at the station 250,000 watts. It is proposed to have three such machines in the first instance—two working and one in reserve; and the building will be so arranged that the plant may be readily increased to a total of twelve sets. In order that unnecessarily large engines may not be employed when they are not wanted, a smaller set of plant will be brought into use during the time the demand for the light is small. From the station the electricity will be conveyed on the five-wire system (which is an extension of the three-wire system) to the consumers' premises. The current will be supplied on the direct system, at 400 or 100 volts to suit requirements. The compulsory area of supply is regarded as affording the Corporation good scope for testing on their own account the feeling of the citizens in regard to the electric light. Dr. Hopkinson has to some extent based his estimate of the demand on the quantity of gas at present consumed. Of course, it is not anticipated that the electric light will entirely supersede gas. In the compulsory area, the consumption of gas is at present 95 million cubic feet; and in the whole area of supply, 571 millions. This gives a maximum demand of a little less than 90,000 cubic feet in the lesser area, and rather more than 500,000 cubic feet in the larger one. Consumed with ordinary burners, Manchester gas gives about 2½ candles per cubic foot per hour; whereas electricity takes about four watts to produce one candle light. Hence one cubic foot of gas per hour is equivalent to about ten watts. To provide the compulsory area with electric light, machinery will be needed capable of delivering 900,000 watts; and to supply the whole area machinery equal to 5,000,000 watts. The mains will be carried right up to terminals in the different premises to be lighted, as in the case of gas; and the landlords or tenants, subject to the supervision of the officials of the Corporation, will be required to provide the fittings. One large customer for the light will be the Corporation. It was originally intended to have a separate installation for the Town Hall. But this idea has now been abandoned; and it has been arranged that the lighting of the hall shall form part of the larger scheme. With regard to price, it is not yet possible to say anything definite, as the matter is still under consideration. If the light is charged at the rate of 3d. per unit of 1000 watts, the cost will be equal to the price at which gas is sold in the city; and it could, it is stated, be produced at much less than this, if the demand were continuous and steady for ten hours per diem. But some consumers will only take their supply for about an hour per day, and that at the busiest time; and from these little or no profit will be made, even at the maximum charge of 8d. per Board of Trade unit. With the view of encouraging the continuous use of the light, it is proposed to adopt a graduated scale of charges.

The Failure of Mr. Ungar.—In the London Bankruptcy Court on Tuesday last, Mr. Registrar Giffard confirmed a scheme of arrangement unanimously agreed to by the creditors of Mr. Julius Ungar, lamp manufacturer and importer of gas-fittings, of Commercial Street, providing for the payment of a composition of 10s. in the pound. The debts were returned at £5005 14s.; and the assets at £1819. It was stated that the failure was mainly due to the result of a verdict in an action brought by him against Messrs. Sugg and Co., Limited, in which, though he recovered £500 damages, he had to pay all the costs of the proceedings.

THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

At the Meeting of the London County Council last Tuesday—Sir J. Lubbock, Bart., M.P., in the chair—the report of the Special Committee on Water Supply, of which the principal portion was given in the Journal last week, was brought up for consideration.

The Vice-Chairman (Sir T. H. Farrer) explained that the report was precisely on the lines of that presented last session—there was no difference in principle. The witnesses of the Council had been severely cross-examined at great length by very able Counsel before the Parliamentary Committee on Water Supply; and the Council would look at that cross-examination to see whether it had in any way shaken the position they took up last year. If they thought it had, by all means let them drop their policy of last session, and adopt a new one. If they thought it had not, then he urged them to repeat and to insist upon that policy, and to employ all the means in their power to carry it into effect. The Committee thought it was wiser to get from the Council an affirmation of this policy in the first instance; and then they had it in contemplation to lay before the Council afterwards the detailed steps which they would propose for the purpose of carrying out that policy. The recommendations of the Committee were as follows:—

1. That the Council, while expressing its readiness, so far as its lega powers enable it to do so, to undertake the duties and obligations mentioned in the first, second, fourth, and fifth recommendations in paragraph 5 of the report of the Select Committee, is unable to accept the condition contained in the third recommendation—that the Council, if constituted the Water Authority, should be required to purchase the undertakings of the eight Water Companies "by agreement, or, failing agreement, by arbitration, within a fixed period."

2. That the Council is prepared to accept and act upon the following recommendation contained in the report of Sir William Harcourt's Select Committee on Water Supply—viz., "That, for certain purposes at least, it be desirable to acquire the undertakings of the existing Companies, if the same could be obtained on fair and reasonable terms."

3. That the Council is of opinion that the price to be given for the undertaking of any Company should depend, not merely on past dividends or on Stock Exchange values, but upon the true value of the undertaking, having regard to its legal position and liabilities, to the condition of the property, and to its ability to supply future wants.

4. That, in order to arrive at a satisfactory conclusion on this last question, it is essential, before any terms of purchase can be considered, that the liabilities to capital expenditure for new or supplementary sources of supply in the immediate future should be authoritatively ascertained.

Mr. Beachcroft said he proposed to move the following amendments: (1) To insert after the word "unable" in the first recommendation the words "without further information." (2) To omit from the third recommendation the words "and to its ability to supply future wants," and to substitute the following words: "And that the Committee be authorized to inquire and report to the Council as to what are the present statutory obligations on the Companies to provide and supply water, so that the Council may be informed whether the cost of supplementing existing supplies, if such should be found necessary, ought fairly and reasonably to be taken into account in determining the present value, to purchase, of the Companies' undertakings." (3) To add to the fourth recommendation the following words: "And that, in face of the contingency of no terms of purchase being possible, and of Parliament supporting the opinion of its Committee that purchase of the Companies' undertakings must precede the establishment of an independent supply, it is essential that the only alternative plan of solving the problem—viz., the one suggested to the Select Committee on behalf of the Companies, of amalgamation of the eight existing Companies, accompanied by more complete control and increased obligations in regard to supplementary supply—should be taken into consideration."

The debate was adjourned.

MR. WEBSTER'S SCHEME FOR AN AUXILIARY WATER SUPPLY FOR LONDON.

Visit to the Wells at Rickmansworth.

On Saturday, on the invitation of Mr. George Webster, of Harefield Grove, near Rickmansworth, a numerous party of gentlemen proceeded by special train from Euston, to view the pumping operations which have been set on foot in the Colne Valley, at Rickmansworth and Springwell, in connection with what is described as "a scheme for supplying London with pure spring water." These operations have been carried out by Mr. Webster at his own instance, and at his sole cost. The subject has already been referred to in the columns of the Journal; and it may be remembered that the scheme has been so far advanced as to include certain agreements by which the way is prepared, when occasion serves, for bringing a supply from Mr. Webster's wells up to the Grand Junction Water Company's area, as also to a point at Finchley Road and another at Paddington. In a report by Mr. Claud Monckton, C.E., it is stated that by means of the operations which have been carried out, Mr. Webster has a supply of pure spring water available for immediate use, to the extent of 10 million gallons per 24 hours, with the prospect of doubling this quantity. The water itself has been certified by Dr. Percy Frankland as "of most excellent quality for drinking and all other dietetic purposes." It is stated to be less hard than that supplied by the Kent Company, and if treated by Clark's process, "would be unsurpassed for all domestic purposes."

The visitors on Saturday included Sir W. Guyer Hunter, M.P., Sir Spencer Wells, Mr. A. C. Morton, M.P., Mr. Jabez Hogg, M.R.C.S., Dr. Ker Gray, Dr. Abbotts, and Dr. Ward Richardson, Surgeon-Major Cuffe, Mr. A. H. Haggis, Deputy-Chairman of the London County Council, Mr. Rose-Innes, of the City Corporation, and many others identified with sanitary science, or interested in the public affairs of the Metropolis. Altogether, the company was a large one. On arriving at the Rickmansworth station, the visitors were conducted to an adjacent field, where a well and a bore-hole had been carried down to a total depth of 184 feet, terminating in grey chalk at 138 feet from the surface. The water was nearly on a level with the ground;

and when steam power was applied to the pump, an extensive flow was the result—the water also seeming to be very clear. The party then entered the numerous waggonettes and carriages which had been provided for their accommodation, and drove off to the vicinity of the Rickmansworth Gas-Works. Here, in Wharflane Field, was a smaller well, but with the same total depth of well and bore; the latter terminating in soft grey chalk, reached at a depth of 172 feet. The whole of the strata, from a point 25 feet below the surface, consisted of chalk, either soft or hard. The bore-hole, as well as the one previously named, was lined with steel tubes from the surface of the water down into the solid chalk. The water rises to within 3 feet of the surface; and a considerable volume is obtained by pumping. A further drive conveyed the visitors to what is called No. 2 bore-hole, at Springwell. Here the total depth of the bore and well was 192 feet; chalk being reached at 20 feet from the surface, and the bore ending in very soft chalk commencing at 182 feet. The water naturally overflows, and runs to waste in the River Colne. Again a large volume was discharged when the pumps were set in action. For a time the flow was somewhat turbid in appearance; but this was explained as due to the fact that the pumps had not been at work for several weeks.

The most interesting visit of all was paid to the next bore-hole, situated near at hand. As at the first spot in the Station Field, the well was 12 feet in diameter, and 30 feet deep, with a bore-hole of 40 inches for rather more than 100 feet, reduced to 24 inches below that depth. The total depth of the bore and the well was 282 feet. Chalk was met with at 30 feet from the surface; being covered by gravel. Hard chalk commenced at 84 feet, and the bore terminated in hard grey chalk having no flints. When the pumps are not working, the water overflows into the Colne, which runs close by. On Saturday, a centrifugal pump, with an 18-inch bore, was set in action, when an enormous body of water was sent forth; speedily lowering the contents of the well by 16 feet. Pumping being stopped, the water rose again 5 feet in 3¼ minutes. The 5 feet corresponded to 3530 gallons; coming in at the rate of rather more than 1000 gallons per minute. At a higher level the advance was less rapid; but there could be no doubt that the well, subject to pumping power, gave a very large delivery. It was stated that for a week the water from the well, left to itself, ran to waste at the rate of 70,000 gallons per hour.

It is to be regretted that the day on which the visit took place was mercilessly wet. All present were impressed with the fact that the water supply of the district was indeed abundant. Streams intersected the roads, and fields were like swamps. As one of the company remarked, they saw the water coming up from beneath, and they felt it descending from above. At last all took shelter in the hospitable mansion at Harefield Grove, where Mr. Webster had provided an elegant luncheon for his numerous visitors—who crowded the spacious dining-room to overflowing. At the conclusion of the repast, Mr. Webster, who occupied the chair, offered some appropriate remarks; after which the toast of the Corporation and the County Council was proposed, and responded to by Mr. Rose-Innes, Mr. A. H. Haggis, and Mr. W. H. Dickinson. Other toasts having been honoured, Mr. R. Wilkinson proposed "The Engineering Profession," and spoke in high terms of the quality of the water which Mr. Webster could place at the disposal of the authorities. Any engineering difficulties which apparently obstructed its adoption, he felt assured, could be overcome, even to the extent of introducing a dual service. Mr. Claud Monckton, after alluding to his published report on the character of the supply offered by Mr. Webster, stated that the chalk area round London was capable of furnishing water for the whole of the Metropolis, so as to preclude any necessity for going to Wales. Mr. Jabez Hogg, in proposing a cordial vote of thanks to Mr. Webster, spoke emphatically of the immense resources to be found in the chalk for the purpose of supplying water to the Metropolis.

The proceedings then terminated; and the visitors from London returned to town by special train.

Extension of the Simla Water-Works.—It is extremely satisfactory, says the *Indian Engineer*, to know that the Punjab Government are disposed to act in a liberal spirit towards the Simla Municipality in the matter of the water-works extension and the much-needed completion of the sewage scheme. The cost of these projects has now been fixed at Rs.7,10,000. Towards this sum the Government of India has been asked to make a grant of Rs.3,00,000; the Local Government offering to bear the full charge of establishment, supervision, and other incidental charges (Rs.80,000), and to lend the balance at 4 per cent., without insisting upon a sinking fund being provided. The conditions upon which it insists are that the details of the water-works scheme shall be settled in the local Public Works Department, and the work of construction be carried out by that agency. The Municipal Committee on their part are perfectly willing to leave all details to the officers of that department; though they urge, and with justice, that it is essential to secure the filtration of all water supplied to the station, together with increased facilities for storeage.

The South Kent Water Company and the Water Supply of Cranbrook.—A meeting of the South Kent Water Company was held at Cranbrook on the 1st inst., under the presidency of Sir C. Jessel, Bart. The Chairman said the object was to arouse attention to the fact that the Company had been formed and was awaiting some financial support before commencing to supply Cranbrook and the district with water, as it was authorized to do by Act of Parliament. If the inhabitants guaranteed a certain sum, the water would be laid on without delay; the pumping-station being at Hartley. Mr. E. Easton, the Company's Engineer, said that, after a careful examination, they had fixed on the Lower Ashdown sand-beds as the source of supply; and they had arranged to use water from some wells there which were 30 feet below the surface, and would yield 90,000 or 100,000 gallons per day, while at a lower level 200 or 250 gallons a minute could be obtained. The Company already supplied some public works with water; and at Cranbrook the cost would be £4000 or £5000. It was resolved that an effort should be made to induce the Company to lay mains at Cranbrook.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

The Aberdeen Town Council have recently been threatened with an agitation by the city plumbers, who resented a resolution adopted by the Council several months ago, to the effect that the Council's own workmen should fit up gas-stoves in consumers' houses and should also perform all the work necessary to connect meters with the mains. The subject was before the Council on Monday last, when the Gas Committee recommended that, in the case of meters, the plumbers be allowed to make the connection, subject to rules laid down; but that in the fitting up of coal ranges with gas-burners, the work should be done by the Council's own workmen if the customers desired it. The Council declined to adopt this recommendation; and both descriptions of work will therefore fall to be done by the plumbers, under regulations which they have signified their willingness to agree to. In the discussion in the Council on the subject, Lord Provost Stewart said "he expected that in a very short time the Council would throw up this business altogether, and put the whole thing into the hands of the plumbers;" and that "he thought the Council's business was simply to manufacture gas and let everybody do what they liked as to fittings." Not a very wise remark—the latter part particularly.

From a statement which has been prepared by the City Chamberlain of Aberdeen relative to the gas-stove department, it appears that, while the Corporation have not realized a large return from the sale and hire of stoves, they have every reason to be satisfied with their adventure. Since 1884, when the department was opened, the revenue for sale and hire has been £1045; and the expenditure, £1123. This leaves a deficit of £77. Down to last month, the number of stoves given out was 305; and off them a sum of £620 had been written for depreciation. During the period since 1884, it is estimated that 30 million cubic feet of gas have been consumed in stoves, the profit upon which would be about £1480; and it is calculated that upon the whole transaction there has been a clear profit to the Corporation of £642.

The Forfar Gas Corporation, owing to the increase in the valuation of the gas-works, and to the supplies of coal for last year having been irregularly delivered during the railway strike, have been obliged to raise the price of gas from 4s. 1d. to 4s. 4d. per 1000 cubic feet. Mr. Craik, the Convener of the Gas Committee, however, stated, in making the proposal on Monday night, that they expected to reduce the price to the present figure a year hence.

It is strange—perhaps a trifle amusing—to observe in what out-of-the-way places the apostles of electric lighting crop up. The other week I chronicled an attempt by a London gentleman to persuade the Aberdeen Corporation that they had abundance of electric lighting in the water power of the river Dee. The ingenuousness of that gentleman is, however, altogether eclipsed by that of Professor Forbes, of London, in a proposal to light the city of Edinburgh with electricity by means of the fulzie of the city. The proposal was made at a very private meeting, called by Mr. Councillor Auldjo Jamieson. Had it been at a public meeting, one would have been able to look into the data submitted by the Professor, and form an opinion on the projected scheme. The Edinburgh Town Council have recently resolved upon the erection of furnaces in which to consume the city refuse; and the Professor's recommendation, I gather, is to employ the heat generated in these furnaces in the pumping of water to a reservoir at sufficient height, which could be utilized for the driving of dynamos. The pumping would go on day and night; but the dynamos would only run in the evening. A very pretty scheme; but what would the cost be of land for the reservoir and its construction? as well as the construction and maintenance of pumping machinery, in addition to the dynamos?

Bailie Archibald's resignation of the Convenership of the Works Committee of the Edinburgh and District Water Trust, on account of the Trustees having at their last meeting shelved the Committee's proposals for augmenting the water supply, was submitted to the Trustees on Thursday. Lord Provost Boyd, I am sure, but echoed the sentiments of the entire community when, in proposing that Bailie Archibald be requested to re-consider his decision, he said the Bailie had been a most efficient and painstaking official, sparing neither time nor labour in the service of the Trust. His lordship went on to say that Bailie Archibald had frequently gone with the engineers to visit the works, when he might have spared himself the trouble, in his anxiety to master every detail, so as to give all the supervision necessary to the execution of operations which might be going on. There was nothing in the resolution of the Trust at its last meeting, his Lordship explained, which implied either a want of confidence in Bailie Archibald, or a vote of censure upon him; all that took place was simply that a majority of the Trustees differed from him in regard to their policy. These soft words are all very well; but it is doubtful whether Bailie Archibald will be moved by them. The majority of the Trustees did not differ with Bailie Archibald, but on the contrary supported him, until the influence of the municipal election crept in and led a number of his colleagues to prove false to him. The elections will be over in a month; and those who have temporarily deserted him would then be found by his side, and the Manor scheme would go on, as it doubtless will go on. That may be taken as the explanation of the eagerness of the Trustees to get him to re-assume the Convenership. The "majority of the Trustees" are in an undignified position; for they know that if Bailie Archibald returns, it can only be to carry out his proposed scheme. The request to him to return is, in that view, the best testimony he could have that he was right; and looking at it in that way, he might probably be induced to take up the work again, but for one consideration—that of finance. It was his intention to accumulate surpluses from the rates which could be applied in reducing the charge in respect of the new works; and thereby it would not have been necessary to have increased the rates for seven years. The augmentation could thus have been procured without hindering the community; but the Trustees, in reducing the domestic rate from 6¼d. to 5d. per pound, have mutilated the financial side of his scheme and made it much more difficult to introduce. That the reduction was a mistake is shown by the Treasurer's report on Thursday, that only £2750 will be saved this year. Bailie Archibald does not leave the Trust. He will remain a member; and he will be of as much service to the

community as if he were Convener of the Works Committee. It is the Trustees who will suffer in the loss of his guiding hand; and in order to show them the error they have committed, it is likely that in the meantime he will elect to continue in the capacity of an ordinary member.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

Last Tuesday, the Glasgow Corporation Gas Committee made an official visitation of the principal gas-works under their charge. Beginning at the Dalmarnock works, they made a very careful inspection of the reconstructional and extension works which are there in progress, including the new purifier and meter house, the new purifiers, and the new station meter. They then made their way to the Tradeston works. Here the visitors were joined by the Lord Provost, who presided at a luncheon provided for the Committee. Two or three toasts appropriate to the occasion were submitted, and duly honoured; one of them being "The Health of Mr. Foulis," the Engineer-in-Chief, who had designed and superintended the carrying out of all the extensions and reconstructional works which they had inspected. Subsequently, the Committee visited the Dawsholm works, where they also found extensive improvements in progress. Much interest was taken by the visitors in the Foulis-Arrol stoking machine, which was seen at work both at the Dalmarnock and Dawsholm works. Its value as a labour-saving appliance was regarded with a very great amount of favour.

The municipal elections are looming in the immediate distance; and already a number of the wards of this city have held their annual meetings, at which the retiring councillors have given an account of their stewardship, or such of them as have any desire to return to the Town Council. One of the Glasgow Councillors, ex-Bailie M'Laren, who falls to retire at this time, has long been most intimately identified with local gas affairs, as must be known to the many readers of my weekly budget of "Notes." That gentleman addressed a meeting of his constituents of the Sixth Ward last night; and in the course of his remarks he had something to say on gas matters. He stated that during the time that he had been in the Town Council, the price of gas had been reduced from 4s. 7d. to 2s. 6d. per 1000 cubic feet, which was the lowest price paid in any town in Scotland. Mr. M'Laren also referred to what was doing by the Gas and Electric Lighting Committee, in the way of providing electric light for the compulsory area of the city.

At the Fifteenth Municipal Ward meeting, on Thursday evening, another outgoing member of the Gas Committee (Bailie Stevenson) also touched on the gas question in his address to his constituents. He remarked that there were no gas-works in Britain in such good order as those of Glasgow; and that the debt was no more than it was 21 years ago, when they only produced a third of the gas that was now made.

The Glasgow pig iron warrant market has been very quiet during this week, and Scotch warrants have remained at about 47s. per ton cash. Hematite and Cleveland warrants have been rather lower in price than those ruling last week. Yesterday's closing quotations were 48s. 11½d. a ton cash buyers for the former, and 40s. cash buyers for the latter.

Coal-shippers are taking advantage of the low freightage rates, and are sending large quantities of coal abroad. There are said to be still large orders on foreign account to be executed; and as some of the waters will soon be closing up again, it is probable that the next week or two will show special briskness at the shipping depôts. Waggons are still reported scarce, this being especially the case at the far-reaching pits of Lanarkshire. Not a little dissatisfaction, if not chagrin, has been felt this week at the reduction of 6d. in Fifeshire shipping coal, with a like rebate to Baltic and Mediterranean ports. The opinion in the West is that the reduction was made too early. At the General Terminus, main coal was steady all the week; the price ruling from 8s. to 8s. 2d. free on board. Splint, however, was sensibly harder; and 9s. 3d. to 9s. 6d. per ton was paid. Ell maintained the recent advance. The 1s. imposed on household coal has not been very readily met. Altogether values are now much on a level with those of last year.

Spring Water in Kent.—There is a spring of pure water on Lympne Hill, Kent, which has hitherto run to waste; and it is now proposed to convey the overflow, by means of an iron pipe, across the marsh to Dymchurch, on to New Romney, and thence to Lydd and Lydd Camp. The entire distance is about 14 miles; and the expense of laying the main and keeping it in order would be the only one, as no pumping would be necessary. The advantages would consist of an abundant and constant supply of spring water conveyed to each house and hut.

The New Water-Works for Oldham.—The ceremony of opening the new water supply for Oldham, by turning on the water at the Castleshaw new water-works, took place last Wednesday week. The works have been a little over four years in course of construction; the first sod having been cut on May 25, 1887. The members of the Water-Works Committee invited the rest of the Corporation, the local magistracy, and several prominent gentlemen in the town, besides the Mayors of Rochdale and Mossley, to witness the opening ceremony; and there was a very numerous company present. The party proceeded by conveyances to Castleshaw; and on arriving at the upper reservoir, the Mayor (Mr. Alderman S. Buckley) opened the valve, which gave the water passage to all parts of the borough. The Engineer for the scheme (Mr. G. H. Hill) gave a brief description of the works. He stated that the upper reservoir had a top water level of 843 feet ordnance; and a capacity of 234,600,000 gallons. The height of the embankment above the brook was 86 ft. 10 in.; and the area of the reservoir was 30 acres. The lower reservoir had a top water level of 672 feet ordnance, and a capacity of 126,900,000 gallons. The height of the embankment was 59 feet above the brook. The area of the reservoir was 25½ acres; and the length of the aqueduct from Castleshaw to Strinesdale was 3 miles 662 yards. The drainage area to both reservoirs was 950 acres; and the whole would yield a supply of 1,500,000 gallons a day. The cost to the town would be 4¾d. per 1000 gallons. At the close of the ceremony, the party had luncheon in a temporary structure at the works.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 10.

Sulphate of Ammonia.—There is very little to be reported; the market remaining *in statu quo*. Makers do not seem to be pressing their sulphate for sale; and the very low offers buyers are now making seem to be generally declined. The inquiries which were noticed at the end of last week appear to have resulted in business; but, as far as can be seen, at very low prices. The immediate future seems to depend entirely upon the demand; and it is probable that some of the dealers will have to cover their sales before the end of the month. Quotations are made at £10 8s. 9d. and £10 10s. with a slightly steadier tendency. Nitrate is very steady; but there is no movement in prices.

LONDON, *Oct.* 10.

Tar Products.—This market is far from being satisfactory. Anthracene and benzols are unsaleable; and prices are receding. Pitch is not quite so firm. But it is believed that makers are oversold in this article; and very little new business is being reported, although shipments on old contracts are very brisk. Carbolic acid is weaker; and the demand is extremely bad. There is a little more inquiry for creosote and common tar oils; but reports go to show that makers are increasing stocks. A large contract for tar has been closed during the week at 23s.; while one or two smaller ones have realized 25s. Other prices of products are: Pitch, 33s. to 35s. Benzol, 90's, 3s. 7½d.; 50's, 2s. 7½d. Toluol, 1s. 5d. Solvent naphtha, 1s. 4d. Crude naphtha, 1s. 1½d. Creosote, 1½d. Carbolic crystals, 6d.; crude, 60's, 1s. 1½d. Cresol, 7½d. Anthracene (nominal), "A" quality, 1s. 2½d.; "B," 10d.

Sulphate of Ammonia.—Country shipments are much larger; but most of them, it is stated, are on old contracts. The demand is poor; and price no better. Sulphate has never been known to be so dull and difficult of sale as at the present time. Buyers are conspiring with "operators" to keep prices down; and sellers would be wise not to offer sulphate through more than one channel at a time. Much mischief arises from dealers hawking round the same parcel; thus making the quantity offering appear larger than it really is. The price has varied from £10 5s. to £10 10s.; but an important sale is noted at £10 7s. 9d. Gas liquor is quoted at 4s. to 5s.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

The pressure of demand reported during September has fallen off since the commencement of the present month; and the increase in prices has scarcely in all cases been maintained to the full extent. A good deal of the buying going on during September was no doubt in anticipation of an early upward movement in prices; and merchants and consumers, having to a considerable extent bought in advance, are now less anxious about placing out further orders at the higher rates. There is, however, still a very steady business doing, which is sufficient to take away the present output; so that little or nothing is going down into stock. Although this in some measure is due to the indifferent manner in which the colliers are working, and the advance in prices is evidently causing an uneasy feeling amongst the men with regard to wages, so far there has been no demand for any actual rise; but at some of the collieries, an agitation is going on with regard to certain classes of work which hitherto have not been paid for, and which practically means an advance in wages. Taking the upward movement in prices all round, it has scarcely averaged more than 6d. per ton upon house fire coals, in all cases where concessions have been made during the summer months; and although best Wigan Arley coals are quoted at 12s. 6d. to 13s. per ton at the pit mouth, the minimum figure would perhaps represent more nearly the average actual selling prices. Pemberton 4-feet coals and second qualities of Arley average 10s. 6d. to 11s.; and common house fire coals, 9s. to 9s. 6d. per ton. The position with regard to other descriptions of fuel remains practically unchanged. The commoner qualities of round coals continue only in moderate inland demand for iron-making, steam, and general manufacturing purposes; whilst for shipment there has scarcely been so much doing, and prices are not more than maintained at late rates. For inland sales, steam and forge coals do not average more than 8s. to 8s. 6d.; and for shipment good qualities of steam coal are not fetching more than 9s. 6d. to 10s. per ton delivered at the High Level, Liverpool, or the Garston Docks. With regard to engine classes of fuel, the market remains in a most unsatisfactory condition. The better qualities move off fairly well, but are plentiful for all present requirements; while common slack continues a general drug, with surplus supplies pushed for sale at all kinds of prices, which render anything like definite quotations almost out of the question. At the pit mouth, burgy averages 6s. 6d. to 7s., and the best qualities of slack 5s. 6d. to 6s.; but in common slack, special lots are being offered at about 2s. to 2s. 6d. and 3s. per ton at the pit mouth, with prices ranging upwards according to the quality of the fuel, or the position of the seller.

Northern Coal Trade.—There is decided easiness in the Northern coal trade, chiefly due to the falling off in the demand for steam coal, through the approaching close of the Baltic season. One or two of the chief collieries have had a few days' idle time; and the price has been reduced to obtain prompt tonnage. For best Northumbrian steam coal, the current price is 11s. 6d. free on board; and for small steam, about 4s. is the current quotation. Gas coals are in very full demand, both for shipment and for local consumption. For odd cargoes, from 9s. 6d. to 10s. per ton free on board, is the price; but the contracts vary considerably both above and below these figures, according to the date of the contract. The supply of gas coals is very good just now; but it is well taken up. Bunker coals are flat, and the price is weaker. Manufacturing coals are a little more in request. Coke does not show any material alteration.

Newark Water Supply.—The Water Committee of the Newark Town Council were empowered, at a meeting of that body yesterday week, to improve the quality of the present water supply by filtration and to take steps to obtain water from a new source at Edingley.

Penistone Water-Works.—The Penistone Local Board have arranged to supply a large quantity of water to several adjoining districts; and it will be necessary to put up additional duplicate pumping machinery, and otherwise alter and extend the works to provide the increased supply. The Local Board have called in Mr. W. H. Radford, C.E., of Nottingham, to report on the present works, and advise them as to the proposed extensions.

Proposed Purchase of the Ilkley Gas-Works by the Local Board.—The Ilkley Local Board, having been unable to get the Gas Company to state at what price they would sell their undertaking, have passed a resolution to the effect that the Solicitor take the necessary steps to obtain an Act of Parliament for the following, among other, purposes: (1) The purchase of the gas-works; and (2), the obtaining of an additional supply of water.

Letting Gas-Engines on Hire in Dublin.—In the JOURNAL last week, reference was made to the exhibition of gas cooking and other appliances which the Alliance and Dublin Consumers' Gas Company had opened in the Leinster Hall. Among the exhibits were two fine samples of "Otto" gas-engines, sent by Messrs. Crossley Bros. In order to favour the extended use of these engines, the Company have arranged to let them out on the hire-purchase system—the period extending over six years; and they will allow a reduction of 10 per cent. on the amount paid for each quarter's gas supplied for motive power, if registered by a separate meter. The Company's stove and motive power department is under the management of Mr. Walter J. Sugg.

The Lighting Arrangements at the Tasmanian Exhibition.—At a recent meeting of the Executive of the Tasmanian Exhibition, the General Manager (Mr. Jules Joubert) presented a report, in the course of which he dealt with the subject of lighting the buildings and grounds. He said that, whatever the ultimate decision of the Commissioners might be as to the best and cheapest mode of lighting—whether gas or electricity—it was advisable that instructions should be at once given to the local Gas Company to lay the necessary mains, services, meters, &c., as a standby. He had received an offer from the Company to lay on loan all pipes and fittings for the whole period of the exhibition for a lump sum of £300, and to supply at cost price all gas consumed. Having gone into a most careful calculation of the quantity of gas that would be needed for 100 nights, he found that the very utmost could not possibly exceed 3 million feet. This quantity, at the rate charged, would come to between £800 and £900; or, together with the cost of fittings, something like £1200. The cost of the electric light, according to a letter received from England by the last mail, would be £3400; this amount not including space, or the cost of erecting boilers, dynamos, &c. With such facts before him, he had no hesitation in recommending the acceptance of the offer made by the Gas Company, so that they might at once cable for the necessary lamps, globes, and other appliances. After some discussion in Committee, the recommendation was agreed to.

Fatal Accident to a Gas-Engine Attendant.—Last Thursday, Mr. A. Braxton Hicks held an inquest at Battersea, concerning the death of William G. Quick, 47, a mechanical engineer, lately residing at 61, Solon New Road, Brixton, and employed by Messrs. Crossley Bros., Limited, of St. Bride Street, City, who was killed while working a gas-engine on the works of the Projectile Company at Acre Road, Battersea. Henry G. Hockley, a machinist, stated that at about half-past seven on the morning of the previous Monday he was working at a lathe bench near the deceased, who was in charge of a gas-engine. The deceased tried to get between two revolving bands attached to the engine, when his feet became caught, and he was thrown on to his chest. The band on which he fell then drew him towards a fly-wheel, and he was jammed in the engine. The driver at once stopped the machinery, and witness cut the bands and liberated the deceased. A doctor was sent for; but, on arriving, he pronounced life to be extinct. Edwin H. Grant, a labourer, who was learning to work the engine in question, said the deceased had frequently warned him not to get between the bands; but he used to do so himself for the purpose of oiling the machine. A fence was near the engine; but not where the accident happened. Mr. J. Young, the Resident Engineer, said the deceased was in charge of the engine, and it was quite unnecessary for him to go where he did. Dr. F. Stott said death was due to the injuries deceased had sustained, which were very extensive. The jury had an animated discussion as to whether or not the machinery ought to be better fenced; and ultimately they returned a verdict of "Accidental death."

The Transfer of the Warrington Water-Works to the Corporation.—At the meeting of the Warrington Town Council last Tuesday, the minutes presented by the Water Committee stated that, at the meeting of the Committee on the 28th ult., the Town Clerk submitted a claim sent in by the Warrington Water Company, showing the amount payable by the Corporation on the transfer of the undertaking; also a report on this claim by Mr. J. Bolton, who had been appointed by the Corporation to examine the Company's accounts. The summary was as follows: Balance of revenue, as per Company's accounts to June 30, 1891, £5366 18s. 8d.; proportion of reserve fund to be retained by the Company, £1246 14s. 9d.; do. of profit from the 24th to the 30th of June (not including meter-rents), £48 6s. 9d.; adjustment of overpaid rates and sundries, £290 19s. 5d.; costs, compensation, and expenses, as provided by the Act, £3000—total, £9952 19s. 7d. Deduct: Dividends paid for the first half of 1891, £3912 3s. 9d.; payments on account of parliamentary expenses already made by the Company, £813 4s. 7d.; allowances for doubtful debts, £39 17s. 8d.—total, £4765 6s. Balance, £5187 13s. 7d. In the course of his report, Mr. Bolton said that the balance agreed exactly with the formal claim received by the Corporation from the Company, which was handed to him for examination. With regard to the apportionment of rents, rates, taxes, and insurance between the Corporation and the Company, he had seen all the vouchers, and recommended its acceptance. He expressed his pleasure in reporting that the Directors of the Company had adopted a liberal construction of the Act; and he felt sure there was not a point in the settlement on which there could be any dispute or difference of opinion. The Committee resolved that the report should be approved and entered on the minutes; and that the Company should be requested to retain, out of the moneys in their hands, the sum of £5187 13s. 7d., shown in their claim.

Latrobe Gas Company, Limited.—At the last half-yearly general meeting of this Company, the Directors reported a continuance of the success of the undertaking. The returns for the six months ending June 30 last were £526, against £498 and £447 for the corresponding periods of 1890 and 1889. They recommended a dividend at the rate of 7 per cent. per annum; and this was declared.

The Coal Production of the United States.—A Census Office bulletin lately issued places the total coal production of the United States last year at 141,229,515 short tons. The value of this coal at the mines before shipment, was $160,226,323. The average value of a short ton is $1 58c. at the mines. The production of bituminous coal during the same year was 95,629,026 short tons, valued at $94,346,809; the average value at the mines being 99c. per short ton. The entire production of coal showed an increase over 1880 of 97·57 per cent.; while the total value has increased by 67·53 per cent.

Sale of Shares in Suburban Gas Companies.—At the Mart, Tokenhouse Yard, on Tuesday last, Mr. Alfred Richards offered for sale by auction, on the instructions of the Directors of the West Ham Gas Company, £12,800 of 4 per cent. perpetual debenture stock; being a new issue in accordance with the terms of the West Ham Gas Act, 1889. The stock was offered in 128 lots of £100 each, and realized a total of £13,408 15s. or an average of £104 15s. 1d. per £100 stock. Each lot was put up separately; and the whole stock was disposed of in less than a quarter of an hour—affording strong evidence of the continued faith of investors in gas property. Mr. Richards sold on the previous day about 100 original £5 shares in the same Company, at £11 per share; as well as some original shares in the Lea Bridge District Gas Company at £19 10s. per share, and £10 shares in the Harrow District Gas Company at £15 15s. per share.

Johannesburg Water-Works Company.—The report of the Directors of this Company for the year ending June 30 last states that the gross earnings amounted to £34,901; and that the expenditure was £17,422—leaving a net profit of £17,459. After providing £4200 for payment of interest on debentures, and bringing forward the balance of £7855 from last year, there was a sum of £21,114 standing to the credit of the profit and loss account. The Company are at present engaged in constructing a high-service reservoir at a level 30 feet above the tower of the Johannesburg Hospital. This work, which will be completed in about two months, will, it is stated, enable the Company to give a constant supply of water, at a satisfactory pressure, to all the high parts of the town and its surroundings. Other works are contemplated, which will be proceeded with as required. The storeage capacity was considerably increased during the past year; and further steps in this direction are being gradually taken. The quality of the water is reported to be excellent, and the supply abundant—being ample for all possible requirements. Hydrants have been fixed at different parts of the town, for the purpose of supplying water for extinguishing fires, and other public purposes. A dividend of 5 per cent. was declared on the 3rd of July; and the Directors have every reason to believe that, with the Company's greatly improved position and prospects, shareholders may look forward with confidence to regular dividends in future.

Proposed Acquisition of the Cleator Moor Gas-Works by the Local Board.—A special meeting of the Cleator Moor Local Board was held last week, for the purpose of considering an offer made by the Cleator Moor Gas Company to sell their undertaking to the Board for the sum of £16,000, exclusive of stocks, &c.; and, if accepted, to affix the seal of the Board to an agreement to complete the purchase, subject to confirmation by the shareholders of the Company. The Clerk (Mr. H. Rothery) produced the agreement, which he said had been considered by the Lighting Committee, and some verbal alterations made. It had been signed by the Directors, and was ready for the seal of the Board. He read a report by Mr. J. Hepworth, M. Inst. C.E., Gas and Water Engineer of the Carlisle Corporation, on the condition of the works. Mr. Robertson moved that the seal be affixed to the agreement. Mr. Pritchard seconded the proposition. He said he was once opposed to the purchase of the gas-works; but, after hearing Mr. Hepworth's report, and perusing the paper he read at the recent meeting of the Association of Local Boards (see *ante*, p. 442), he had quite changed his mind. He thought the purchase of the works would be beneficial to the ratepayers. The price was in no way extortionate. The motion was carried; and the agreement was then signed and sealed. It provides for the purchase-money being paid by the 30th of September, 1892; and it binds the Local Board to endeavour to promote a Bill in Parliament for the purpose. It becomes null and void in the event of the Board being unable to do so.

The Mersey Aqueduct.—At a recent meeting of the Liverpool Corporation Water Committee, it was resolved that Sir Benjamin Baker should be requested to report, in writing, his opinion with reference to the tunnel works now being carried out at Fidler's Ferry, and as to the prospect of their being successfully completed within a reasonable time, and also to advise the Committee whether in his judgment, and having regard to the importance of getting the permanent works finished with the least possible delay, it is advisable for the Corporation to complete the tunnel according to the present plans, or whether any other plan or a modification of the present ones had better be adopted. The report of Sir Benjamin Baker was laid before the Water Committee at their last week's meeting. In it he expresses his entire approval of the plan that has been adopted by Mr. G. F. Deacon, Engineer of the Vyrnwy Works, and states that there is no reason to deviate from the course hitherto pursued. The Committee thought that such a report from a gentleman who is an eminent authority on engineering works of this kind, was eminently satisfactory. There is every probability that, during the future progress of the works at the tunnel, Sir Benjamin Baker will be associated with Mr. Deacon as Consulting Engineer. In the course of Mr. Deacon's last report on the tunnel, he says: "I have reason to believe that the disappointments which have occurred in connection with this tunnel have led to the impression in some minds that its completion is practically impossible. I have consistently urged the contrary; and the experience gained in the progress of the work has increased the confidence I have always felt that it will be satisfactorily carried out."

The Price of Gas in the South Metropolitan Company's District.—The South Metropolitan Gas Company have notified to the various Local Authorities in their district that, although the price of gas has been raised to the ordinary consumers from 2s. 3d. to 2s. 6d. per 1000 cubic feet, no addition will be made to the charge for the public lamps, as it is believed that the advance will be only temporary.

Failure through Electric Light Speculations.—Under the failure of Hugh A. Fergusson, described as of Berkeley Lodge, Upper Berkeley Street, of no occupation, accounts have been filed in the London Bankruptcy Court. The liabilities are £26,166, of which £19,202 are unsecured; and the assets, £565. The debtor states that from 1876 to 1886 he was engaged in America and elsewhere in mining, cattle ranching, and various trading and financial ventures and speculations, from which he accumulated and realized a large sum. The bulk of this he eventually invested in certain electric light companies, in which he became financially and actively interested; and it is to losses in connection therewith that he attributes his failure.

A Gas-Cooked Dinner in Dublin.—Mr. W. F. Cotton, Secretary of the Alliance and Dublin Gas Company, gave last Thursday an elaborate dinner to a number of leading citizens and representatives of the Press, to celebrate the success which had attended Messrs. Richmond and Co.'s exhibition of gas appliances, mentioned in the JOURNAL last week. Mrs. and Miss Thwaites were specially retained for the production of the dinner, which was prepared and cooked before a crowded audience, and was pronounced by the guests to be a decided success. A number of suitable toasts, including the health of Messrs. Cotton and Richmond, were proposed, and were received with enthusiasm; and the opinion was everywhere expressed that this practical demonstration of a gas-cooked dinner was most convincing of the adaptability of the gas-range to both high-class and ordinary domestic cookery.

More Fatalities through the Use of Paraffin Lamps.—Just before midnight last Saturday, a serious fire broke out in Manor Road, Wallington, resulting in the total destruction of four shops. The explosion of a paraffin lamp set fire to an oil-shop, in the occupation of Mr. C. Willis, and, owing to the inflammable nature of the stock, the flames quickly spread to the adjoining premises. Notwithstanding the prompt attendance of engines, all four shops were burnt out, together with their contents. A shocking paraffin lamp accident occurred in Liverpool early last Sunday morning, whereby three persons lost their lives. William Brown upset a lamp; and in endeavouring to save his son (a child about three years old) he was dreadfully burned. Mrs. Brown, in her fright, jumped through the first-floor window with an infant in her arms, and the child was killed by the fall; while the father and the boy have since died from their burns. The mother is in the hospital, and is not expected to recover.

Lead-Poisoning in Yorkshire.—The Local Government Board appear to be taking in hand an investigation into the causes of lead-poisoning by drinking water, from which several districts in the West Riding have suffered to a marked extent during the past few years. Last Wednesday Dr. Barry and other representatives of the Local Government Board had an interview with the members of the Water-Works Committee of the Keighley Corporation; and subsequently they inspected the water-works. The conference and other proceedings were conducted privately. It will be remembered that a few years ago Keighley was one of the localities the inhabitants of which suffered severely from lead-poisoning. Since that time the Corporation have been experimenting with a view to a remedy, by treating the water with limestone, both native and burned; and this has been attended with satisfactory results. In their recent application to Parliament, the Corporation have obtained leave to extend the experiment tried in the first instance at Black Hill to their main source of supply at Watersheddles.

San Paulo Gas Company, Limited.—The report of the Directors of this Company states that there has been a continued steady increase in the business. Comparing the half-year's working to June last with the corresponding period of 1890, there has been an increase in the gas consumption of morethan 30 per cent., consequent upon the erection of 210 additional public lamps and the fixing of 657 meters; the number of the latter in private use being 3662, that of the public lamps totalling 1692. The works and plant have been maintained in proper order and efficiency. The working profit for the half year amounted to £11,309; but from this the large sum of £3671 has been deducted to equalize the rate of exchange, which had fallen considerably. This, with the great difficulty that exists in discharging coal, &c., at the Port of Santos, may further prejudice the current half-year's working. A sum of £1000 having been transferred from freight, &c., equalization account, the Directors recommend a dividend for the half year at the rate of 10 per cent. per annum, free of income-tax. This will absorb £9791, the balance of £85 being carried forward.

Bradford Corporation Gas, Electricity, and Water Supply.—The Bradford Borough Accountant (Mr. G. A. Thorpe) has just issued his abstract of the Corporation accounts for the year ending March 31 last. With regard to the gas and electricity undertakings, it is stated that the gas revenue account is made up for fifteen months, commencing on Jan. 1, 1890, and terminating on March 31 last; and it shows that during this period a net profit of about £25,516, or an annual profit of about £20,000 was realized. The electricity department was not so fortunate, as the revenue account reveals a total net deficiency of £1739. The loss for the fifteen months, however, is altogether out of proportion to the amount standing to the debit of net revenue at December, 1889, which was £1079, indicating a loss for the fifteen months of only £660. The loss on this undertaking, it is remarked, is, therefore, a diminishing quantity; and if it continues to decrease in the same ratio, the probability is that at the end of the next year a clear profit will be made. As to the water accounts, the total receipts for water were £114,843; and for sundry other matters, £3959—making a total of £118,802. The total payments, including interest on loans and sinking fund were £118,023, indicating that the water undertaking about pays its way. The receipts on water fund capital account were £44,535; and the payments, £44,010.

Coal in Belgium.—The extraction of coal in Belgium in the first half of this year was 9,094,389 tons. The imports of coal into Belgium in the same period were 789,971 tons, while those of coke were 60,705 tons—equivalent to 80,940 tons of coal; making an aggregate of 9,965,300 tons. The stocks of coal on hand in the country at the close of the half year were estimated at 481,945 tons. The exports of coal from Belgium in the first six months of this year were 2,074,946 tons, while those of coke were 482,418 tons—equivalent to 643,759 tons of coal. These deductions, taken together, amount to 3,200,648 tons; leaving the consumption of coal in the kingdom in the first half of this year at 6,764,652 tons.

The Supply of Water to Re-Let Houses.—At the Brentwood Police Court last Thursday, the Magistrates gave their decision in the case reported in the JOURNAL last week (p. 635), in which the South Essex Water Company were summoned for neglecting to supply water to a house at Brentwood at a time when the owner was entitled to a supply. It may be remembered that the water had been laid on from the main to the house by the landlord, and a supply was given for some years. The house became temporarily unoccupied; and the Company, without notice to the owner, severed the connection. Upon the house being again let, application was made to the Company to renew the supply; but this they had failed to do, and the connection had not been restored. For the owner, it was urged that, as he was not in arrear, and the communication had been severed without notice to him, the Company were bound to restore it. For the Company it was contended that, as there was water in the main which the owner could draw upon by restoring the connection, they had not neglected to supply, and that, even in the case of an empty house, they were entitled to cut off the water if the rate was not paid, as it was no part of their duty to see if houses were unoccupied. The Magistrates held that at the time the water was cut off, no water-rate was in arrear, and consequently their action was wrong, inasmuch as there was no person "requiring, receiving, or using the supply of water" within the meaning of section 68 of the Water-Works Clauses Act, 1847. They imposed a penalty of 10s., and 6d. a day from the date of the request for a supply. On the application of the Company, they granted a case.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 660.)

Issue.	Share	When ex-Dividend.	Dividend or Div. Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	+½	6 0 0
100,000	10	,,	7½	Do. 7 p.c	10	11½—12½	+½	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	28 May	8	Bahia, Limited	20	13—15	..	10 13 4
200,000	5	13 May	7½	Bombay, Limited	5	6½—7½	..	5 3 5
40,000	5	,,	7½	Do. New	4	4½—5½	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	218—223	..	5 9 10
125,000	,,	,,	9½	Do. New	100	157—162	..	5 14 2
220,000	20	16 Sept	11½	Brighton & Hove Original	20	40—42	..	5 9 6
444,250	Stck.	16 Sept.	10	Bristol	100	208—213	..	4 13 11
320,000	20	10 Apl.	11½	British	20	45—47	..	4 15 9
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18—20	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c.	10	13—15	..	5 13 4
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	7—8	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	90—95	..	6 6 4
150,000	20	13 Aug.	8	Cagliari, Limited	20	24—26	..	6 3 1
550,000	Stck.	10 Apl.	13⅜	Commercial, Old Stock	100	250—260	−5	5 5 9
130,000	,,	,,	10⅔	Do. New do.	100	190—200	..	5 7 6
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119—124	..	3 12 7
800,000	Stck.	11 June	10	Continental Union, Limited	100	230—240	..	4 3 4
200,000	,,	,,	7	Do. 7 p. c. Pref	100	190—200	..	3 10 0
75,000	Stck.	16 Sept.	10	Crystal Palace District	100	197—202	..	4 19 0
486,090	10	15 July	10	European, Limited	10	20—21	..	4 15 3
354,060	10	,,	10	Do. Partly paid	7½	14½—15½	..	4 16 9
5,470,640	Stck.	13 Aug.	13	Gaslight & Coke, A, Ordinary	100	224—229	−4	5 13 6
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94—97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	253—258	−1	3 17 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118—123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	172—177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	160—163	..	4 5 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	250—255	−1	3 18 5
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	152—157	−1	3 16 6
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	100	112—115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120—125	..	3 12 4
908,000	,,	,,	6	Do. 6 p. c. do	100	163—168	..	3 11 5
3,800,000	Stck.	13 May.	12	Imperial Continental	100	224—229	−3	5 4 9
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4¾—5¾	..	6 6 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	109—111*	..	4 10 1
541,920	20	11 June	6½	Monte Video, Limited	20	16½—17½	..	7 8 6
150,000	5	28 May	10	Oriental, Limited	5	8¼—8¾	..	5 14 3
60,000	5	30 Sept.	7	Ottoman, Limited	5	4—5*	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	2½—3½	..	—
420,000	100	4 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	92—97	..	6 3 9
500,000	100	1 June	16	2nd Do.	100	90—95	..	6 6 4
150,000	10	28 Apl..	10	San Paulo, Limited	10	13½—14⅜	..	6 18 0
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	265—275	−6½	5 12 9
1,350,000	,,	,,	12	Do. B do.	100	220—225	−5	5 6 8
200,000	,,	,,	13	Do. C do.	100	230—240	−2½	5 8 4
700,000	,,	26 June	5	Do. 5 p. c. Deb. Stk.	100	141—145	..	3 9 0
60,000	5	16 Sept.	11⅓	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
729,281	Stck.	26 June	10	Chelsea, Ordinary	100	265—270	..	3 14 1
1,720,560	Stck.	10 Apl.	8	East London, Ordinary	100	212—216	..	3 14 3
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138—143	..	3 3 0
700,000	50	11 June	8	Grand Junction	50	109—113	..	3 11 9
708,000	Stck.	13 Aug	10½	Kent	100	270—280	..	3 15 0
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	237—242	..	3 18 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	193—198	..	3 15 9
260,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118—121*	..	3 6 1
500,000	100	13 Aug.	12½	New River, New Shares	100	341—346	..	3 10 1
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	123—126	..	3 3 6
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	165—170	..	3 16 5
126,500	100	,,	6½	Do. 7½ p. c. do.	100	160—165	..	3 18 9
1,155,066	Stck.	11 June	10	West Middlesex	100	255—260	..	3 16 7

*ex div

Petroleum Lighting in New York.—The American Automatic Lighting Company of New York are introducing a new system of illuminating by petroleum. The oil is fed directly to the wick of the lamp, but only as fast as it is consumed. This is effected by means of a syphon and reservoir—the latter being placed either in the building or outside; and the feed reservoir may thus be removed from danger of fire. It is claimed that the light is equal to that of gas or electricity at about one-fourth the expense. The New York, New Haven, and Hartford Railroad Company are, it is stated, adopting this system in their new stations.

New Joint-Stock Companies.—The Chelsham and Woldingham Water-Works Company, Limited, has been registered with a capital of £20,000, in £10 shares, to acquire certain water works and mains at or near Chelsham and Woldingham, in Surrey, and to carry on the business of a water company. The Ferric Sewage and Water Purification Company, Limited, has been formed, with a capital of £2000 in £10 shares, to acquire certain letters patent granted to J. Bradbury, of Manchester, relating to the utilization of oxide of iron obtained as a bye-product in the extraction of copper from pyrites, &c.; and to carry on business as chemical manufacturers and tar distillers.

Kimberley Water Company.—The Directors of this Company have decided upon paying an interim dividend of 2½ per cent. (being at the rate of 5 per cent. per annum), free of income-tax, for the half year ended June 30 last.

Suicide of the Contractor for the Mersey Water Tunnel.—A painful episode in the somewhat chequered history of the Vyrnwy scheme for supplying Liverpool with water, is afforded by the death of Mr. John Cochrane, the contractor for the tunnel under the Mersey at Fidler's Ferry, through which the pipe-line is to be passed. It will doubtless be remembered that the former contractor for this work was Mr. John Newell, who recently recovered at arbitration the sum of £14,000 from the Liverpool Corporation in respect of disputes which arose, and which led to the stopping of the contract. Mr. Cochrane's firm afterwards took up the work under another contract; but again trouble arose. Mr. Cochrane shot himself in his office in London on the 29th ult.; and the Coroner's jury who inquired into the matter returned a verdict of "Suicide whilst temporarily insane." Evidence was given to show that the deceased was much worried about business matters; and it is believed a full share of his troubles arose from the unfortunate Fidler's Ferry undertaking.

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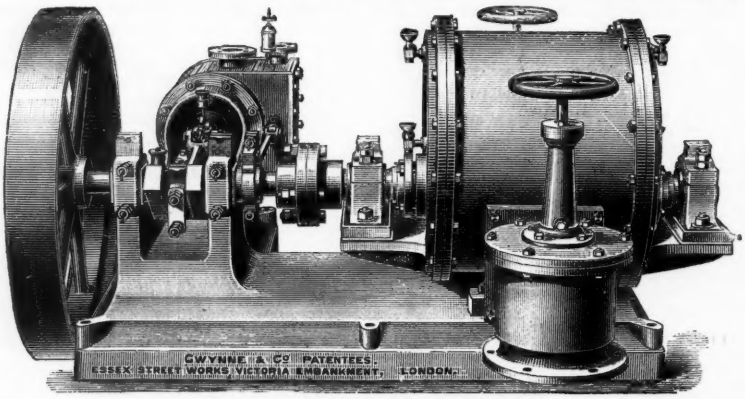

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Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

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Applications, stating age, previous experience, and wages required, to be sent to the undersigned, on or before the 20th inst.

C. B. TULLY,
Engineer and Secretary.

Gas-Works, Sligo,
Oct. 8, 1891.

WANTED, a General Manager for a Company engaged in granting Licenses for the Manufacture of Gas used chiefly as an Enricher. The following qualifications indispensable: Thorough knowledge of Gas-Works; experience acquired in responsible position in large Gas-Works, and good general business experience; undoubted references, especially as to business capacity. The appointment will not be made until the 15th of October. Liberal Salary.
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Address PATENT ABRIDGMENT DEPARTMENT, Newspaper Extract Agency, 54, CHARING CROSS, S.W.

FOR SALE—The Copies of the "Journal OF GAS LIGHTING" (not bound) from No. 515, July 2, 1872, to No. 1468, June 30, 1891. The numbers are in good condition. The copies missing are 871, 872, and 876, of the year 1880.
Offers to No. 2007, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GREAT WIGSTON GAS COMPANY.

GAS TAR.

THE Directors of the above Company, invite TENDERS for the surplus TAR for One year ending Sept. 30, 1892 (probable quantity, about 90 tons), delivered into tanks on the Midland Railway Company's Sidings, or into boats on the Old Union Canal at Thilby Bridge.
Payments monthly.
The Directors do not bind themselves to accept the highest or any tender.
Tenders to be addressed to JOHN A. HARRIS, Manager, by the 21st inst.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

SPENT OXIDE.

THE Gas Committee invite Tenders for the purchase of about 430 tons of SPENT OXIDE.
Further Particulars and Forms of Tender may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed tenders, endorsed "Spent Oxide," to be sent to me not later than Five p.m. on Thursday, the 22nd inst.

By order,
SAML. BROWN, Town Clerk.

Town Hall, Salford,
Oct. 7, 1891.

FENTON URBAN SANITARY DISTRICT.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of 3000 tons of good GAS BURGY, to be delivered at the Works, commencing from the 1st of January next.
For further particulars apply to the Manager.
Tenders to be sealed and endorsed "Tender for Coal," and addressed to the Chairman, Gas-Works, Fenton, on or before Tuesday, the 20th inst.

F. H. DARWIN,
Manager and Engineer.

Gas Offices, Fenton,
Sept. 23, 1891.

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Corporation of Bury are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at their Gas-Works.
Forms of tender may be obtained from Mr. W. H. S. Gendall, Gas Engineer, Elton, Bury.
Tenders, sealed, and endorsed "Tender for Retorts, &c," to be sent in to me not later than Monday, the 19th of October, 1891.

By order,
JOHN HASLAM,
Town Clerk.

Bury, Oct. 1, 1891.

CANTERBURY GAS AND WATER COMPANY.

TO IRONFOUNDERS AND CONTRACTORS.

TENDERS are invited for 700 12-inch CAST-IRON MAIN PIPES (12 feet long), and Connections.
A Specification, Form of Tender, and particulars, will be forwarded on receipt of stamped and addressed envelope.
Sealed tenders, endorsed "Tender for Pipes," to be delivered at the Company's Offices, Castle Street, Canterbury, on or before Saturday, the 24th of October next.
The Directors do not bind themselves to accept the lowest or any tender.

By order,
JAMES BURCH,
Secretary.

Canterbury, Sept. 29, 1891.

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LUX's Gas Regulators for every consumption.
LUX's single-stem Pressure-Gauges.
LUX's Regulator for Gas-Engines.
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LUX's new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

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NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on Tuesday, the 3rd day of November next, at Three o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th day of June last, to declare a Dividend, and to transact the General Business of the Company.
The Transfer Books will be closed from the 21st of October to the 3rd of November next, both inclusive.

By order of the Board,
ALFRED LASS,
Secretary.

Offices: 30, Gracechurch Street,
London, Oct. 6, 1891.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
INCORPORATED BY ACT OF PARLIAMENT.

NOTICE is hereby given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 3rd day of November next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors, a Dividend declared for the Half Year ended the 30th of June last, and the usual Ordinary Business of such Meeting transacted.
Notice is hereby also given, that the Transfer Books will be closed from the 20th inst. to the 3rd of November, both days inclusive.

By order of the Board,
R. S. GARDINER,
Secretary.

30, Clement's Lane, Lombard Street,
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FOR PURIFYING GAS FROM
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Doing all the work of Purification between the Condensers and Purifiers, and relieving them of much work.
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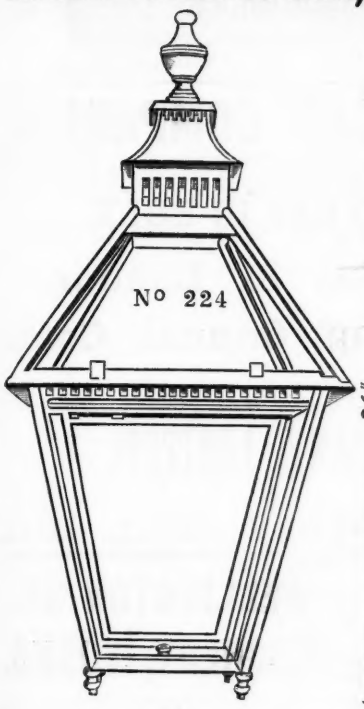

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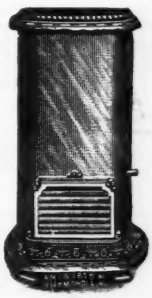

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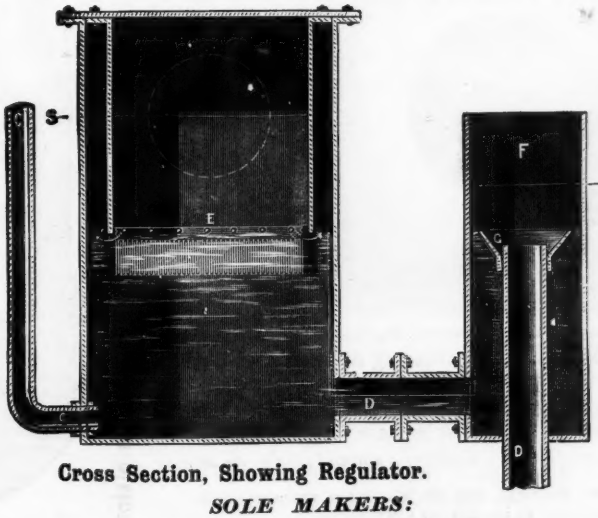

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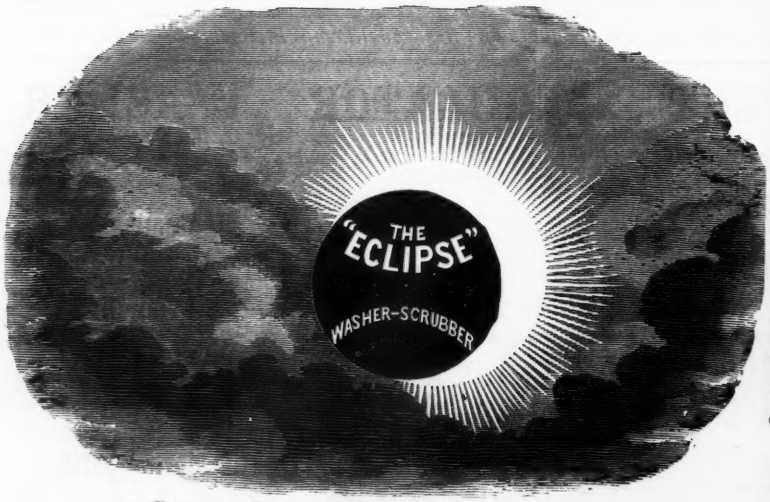

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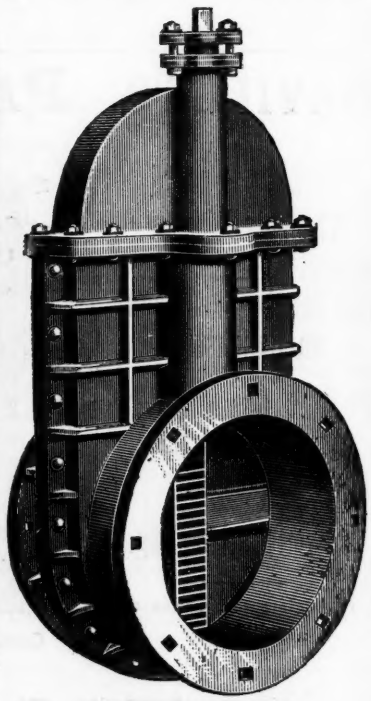

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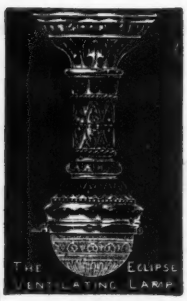

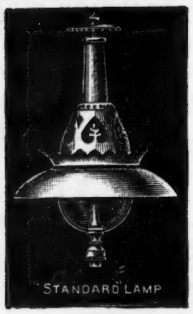

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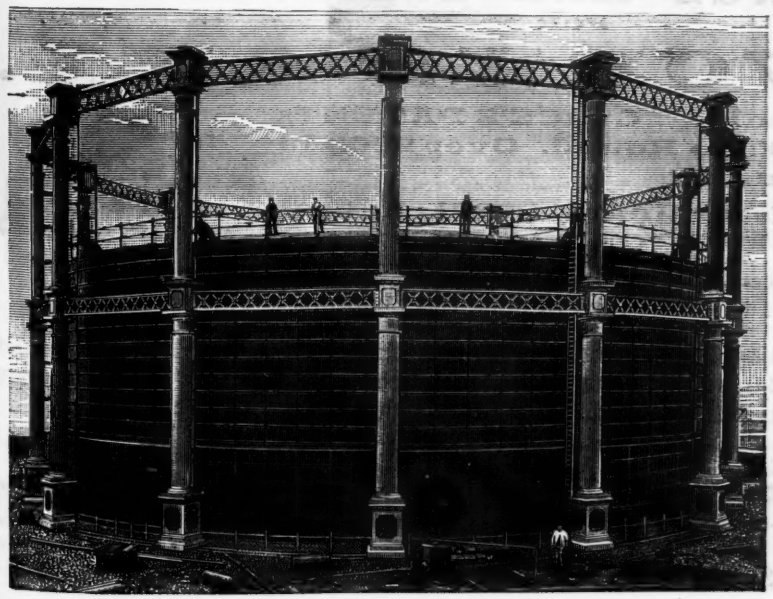

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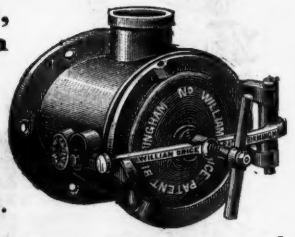

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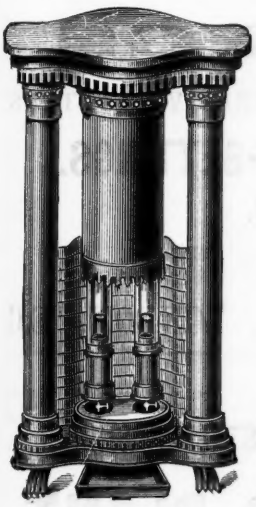

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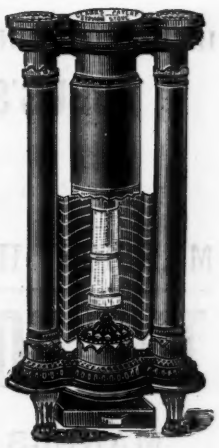

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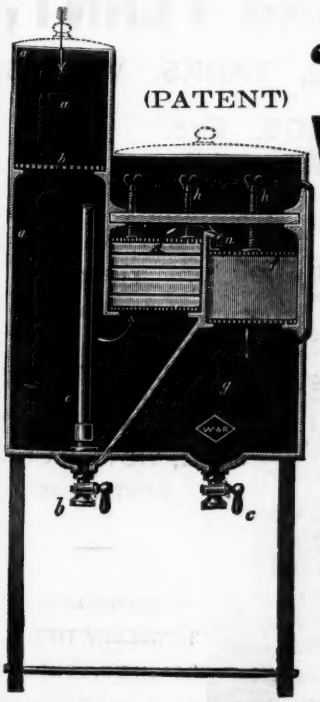

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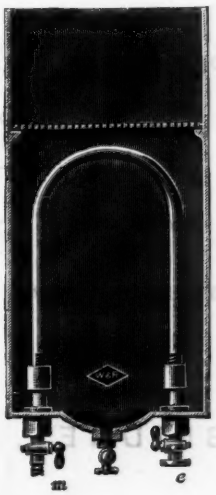

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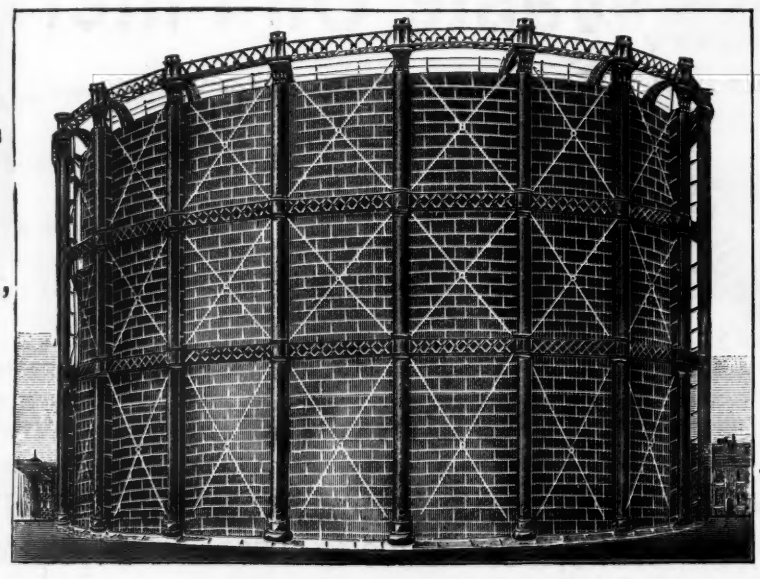

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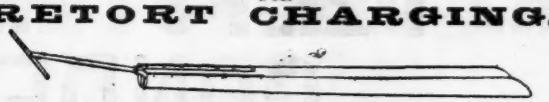

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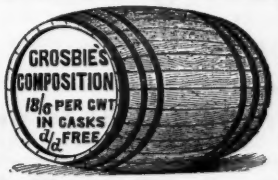

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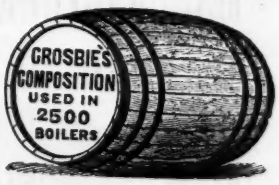

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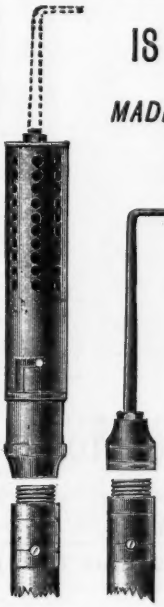

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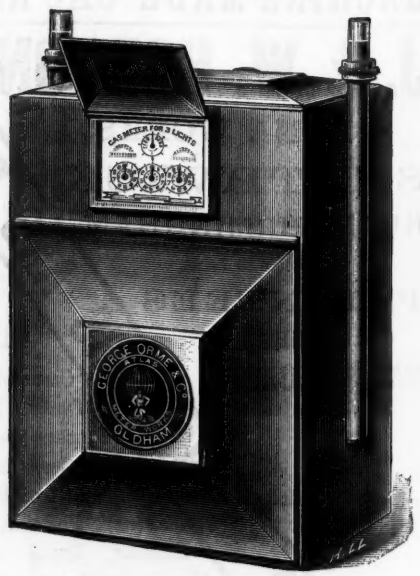

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